

Course Book- School of Medical and Allied Sciences-(SMAS)

1. D. Pharmacy
2. B. Pharm
3. M. Pharm (Pharmaceutics)
4. BPT
5. MPT
6. BSC (CVT)
7. B.Optomety
8. BSC (MLT)

COURSE BOOK – 2020-21

Volume-xx



Vision:

To be recognized globally as a premier school in the field of Pharmaceutical Sciences for imparting value based education, and engaged in multidisciplinary and collaborative research.

Mission:

M1. Establish state-of-the-art facilities to analyze develop test and invent new methods in Pharmaceutical Science by involving multiple stakeholders

M2. Establishing Center of Excellences for multidisciplinary collaborative research by involving industries and academia.

M3. To train the students and faculties into analytical approach and developing new products specially in Natural and Herbal Pharmaceutical Products.

Program Educational Objectives:

Students shall be able:

PEO 1: To undertake the responsibilities of Pharmacist with adequate comprehension of health care system.

PEO 2: To integrate the knowledge base of Pharmaceuticals for better design of drugs and dosage regimen

PEO 3: To reflect as professional with technical and ethical values, providing services for environment and social awareness.

Program Specific Objectives:

D. Pharmacy students shall be able:

PSOs 1: To strengthen the professional ability to Drug uses & adverse reaction /toxicity related issues to broader social context.

PSOs 2: To develop the Pharmacy professional for Community Pharmacy with ethical codes & values.

Program Outcomes:

1.Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; Pharmaceutical sciences; behavioural, social, and administrative Pharmacy sciences, manufacturing practices and sales and marketing.

- 2. Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
- 3. Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
- 4. Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
- 5. Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
- 6. Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
- 7. Pharmaceutical Ethics:** Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
- 8. Communication:** Communicate effectively with the pharmacy community and with society, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
- 9. The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
- 10. Environment and sustainability:** understand the impact of the professional pharmacy solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
- 11. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.



Curriculum

Year 1 st / Semester 1									
Sl. No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	Sessional	ETE
1	DPHT1001	Pharmaceutics – I	3	0	0	3	0	20	80
2	DPHT1002	Pharmaceutical Chemistry - I	3	0	0	3		20	80
3	DPHT1003	Pharmacognosy	3	0	0	3	0	20	80
4	DPHT1004	Biochemistry & Clinical Pathology	2	0	0	2	0	20	80
5	DPHT1005	Human Anatomy & Physiology	3	0	0	3	0	20	80
6	DPHT1006	Health Education & Community Pharmacy	2	0	0	2	0	20	80
7	DPHP1051	Pharmaceutics - I (P)	0	0	4	2	0	20	80
8	DPHP1052	Pharmaceutical Chemistry - I(P)	0	0	4	2	0	20	80
9	DPHP1053	Pharmacognosy (P)	0	0	4	2	0	20	80
10	DPHP1054	Biochemistry & Clinical Pathology (P)	0	0	4	2	0	20	80
11	DPHP1055	Human Anatomy & Physiology (P)	0	0	2	1	0	20	80
Total			16	0	18	25	0	220	880
Year 2 nd /Semester III									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	Sessional	ETE
1	DPHT2001	Pharmaceutics - II	3	0	0	3	0	20	80
2	DPHT2002	Pharmaceutical Chemistry - II	4	0	0	4	0	20	80
3	DPHT2003	Pharmacology & Toxicology	3	0	0	3	0	20	80
4	DPHT2004	Pharmaceutical Jurisprudence	2	0	0	2	0	20	80
5	DPHT2005	Drug Store & Business Management	3	0	0	3	0	20	80
6	DPHT2006	Hospital & Clinical Pharmacy	3	0	0	3	0	20	80
7	DPHT2007	Medical Sales Representative	3	0	0	3	0	20	80
8	DPHP2051	Pharmaceutics - II (P)	0	0	4	2	0	20	80
9	DPHP2052	Pharmaceutical Chemistry - II (P)	0	0	4	2	0	20	80
10	DPHP2053	Pharmacology & Toxicology (P)	0	0	2	1	0	20	80
11	DPHP2054	Hospital & Clinical Pharmacy (P)	0	0	2	1	0	20	80
12	DPHP2055	Medical Sales Representative	0	0	2	1	0	20	80

		(P)							
		Total	21	0	14	28		240	960

Detailed Syllabus

Name of The Course	Pharmaceutics-I			
Course Code	DPHT1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. The student shall be able to understand the requirements for manufacturing and processing of pharmaceutical products.
2. The student shall be able to understand the pharmacopoeial standards for the evaluation of different pharmaceutical products.

Course Outcomes

CO1	Students will be able to understand different pharmacopoeial guidelines for therapeutic substances and pharmaceutical calculations.
CO2	Students will be able to understand the packaging requirements for pharmaceutical products and different techniques for size reduction and size separation.
CO3	Students will be able to understand the techniques of mixing, filtrations and extraction.
CO4	Students will be able to understand the techniques of distillation and sterilization of different materials/products.
CO5	Students will be able to understand the process of tablet, capsule and immunological product manufacturing and their evaluation.
CO6	Student will be acknowledge about how to design and use different advanced medical devices and technologies

Continuous Assessment Pattern

Internal Assessment	Sessional Exam	End Term Exam	Total Marks
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(IA)		(ETE)	
0	20	80	100

Course Content:

Unit I: Introduction of different dosage forms 6 Hours
Their classification with examples-their relative applications.Familiarization with new drug delivery systems.Introduction to Pharmacopoeias with special reference tothe Indian Pharmacopoeia.
Unit II: Metrology 7 Hours
System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products. Use of alligation method in calculations. Isotonic solutions.
Unit III: Packaging of pharmaceuticals 8 Hours
Desirable features of a container and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits. Introduction to aerosol packaging.
Unit IV : Size reduction and Size separation 8 Hours
Objectives and factors affecting size reduction, methods of size reduction- study of Hammer mill, ball mill, Fluid energy mill and Disintegrator. Size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.
Unit V: Mixing and Homogenization 8 Hours
Liquid mixing and powder mixing, Mixing of semisolids. Study of silverson Mixer-Homogenizer, planetary Mixer; Agitated powder mixer; Triple Roller Mill; Propeller Mixer, colloidal Mill and Hand Homogeniser. Double cone mixer.
Unit VI: Clarification, Filtration and Extraction and Galenicals 8Hours
Theory of filtration, Filter media; Filter aids and selection of filters. Study ofthe following filtration equipments-Filter Press, sintered filters, Filter candles,

<p>Metafilter. Extraction and Galenicals- (a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts. (b) Introduction to Ayurvedic dosage forms. Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.</p>
<p>Unit VI: Clarification, Filtration and Extraction and Galenicals 8 Hours</p>
<p>Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments-Filter Press, sintered filters, Filter candles, Metafilter. Extraction and Galenicals- (a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts. (b) Introduction to Ayurvedic dosage forms. Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.</p>
<p>Unit VII: Distillation and Introduction to drying process 8 Hours</p>
<p>Introduction of distillation, methods of distillation, Simple distillation, Fractional distillation, Steam distillation, Distillation under reduced pressure, Destructive distillation.</p>
<p>Unit VIII: Sterilization and Aseptic techniques 8 Hours</p>
<p>Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process. Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and Gaseous sterilization. Aseptic techniques-Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.</p>
<p>Unit IX: Processing of Tablets 8 Hours</p>
<p>Definition; different type of compressed tablets and their properties. Processes involved in the production of tablets; Tablets excipients; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; films coating, enteric coating and micro-encapsulation (Tablet coating may be de.. in an elementary manner).</p>

<p>Unit X: Processing of Capsules and study of Immunological Products 6 Hours</p>
<p>Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules. Study of immunological products like sera, vaccines, toxoids & their preparations.</p>
<p>Unit XI: Advance medical Technology for Variant diseases treatment 8 Hours</p>
<p>Introduction of advance medical technologies and its application, Study of various medical techniques like: Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) Process, Telehealth techniques, Precision medicine and Health wearable devices, 3D printing or Bio printing technique, wireless brain sensors, Robotic surgery technique and Smart inhalers etc.</p>

Suggested Reading

1. Lachman L, Liberman H.A and Kanig J.L., "Theory and Practice of Industrial Pharmacy", Lea and Febiger.
2. Remington – "The science and practice of pharmacy" Vol. I & II. Mack Publishing Co., Pennsylvania.
3. Pharmacopoeia of India, the Controller of Publications, Delhi.
4. S.B. Gokhale, M. S. Tare, Advance drug delivery system, Nirali prakashan
5. Jorge Coelho, Drug delivery system: Advanced technology potentially applicable in personalized treatment, EPMR publisher (Spinger)

Name of The Course	Pharmaceutical Chemistry-II			
Course Code	DPHT1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. The student shall be able to understand different acids, bases, antioxidants, inorganic drugs and Pharmaceuticals.

2. The student shall be able to understand the medicinal and Pharmaceutical importance of compounds.

Course Outcomes

CO1	Students will be able to understand properties and medicinal uses of antioxidants and Gastrointestinal agents.
CO2	Students will be able to understand the chemistry of topical agents, antimicrobials, astringents and dental products.
CO3	Students will be able to understand the chemistry of respiratory stimulants, expectorants, emetics, antidotes and electrolytes
CO4	Students will be able to understand the chemistry of some official compounds and radiopharmaceuticals
CO5	Students will be able to apply chemical tests for quality control of drugs and identification tests of cations and anions.
CO6	Students will be able to apply the knowledge on WHO and radiopharmaceutical guideline.

Continuous Assessment Pattern

Internal Assessment	Sessional Exam	End Term Exam	Total Marks
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(IA)	(MTE)	(ETE)	
	20	80	100

Course Content:

Unit I: General discussion

8 Hours

General discussion on the following inorganic compounds including important physical and chemical Properties, medicinal and pharmaceutical uses, storage conditions and chemical incompatibility.

Acids, bases and buffers-Boric acid, Hydrochloric acid, Strong Ammonium hydroxide, Sodium hydroxide and official buffers.

Antioxidants- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

Unit II: Gastrointestinal agents

10 Hours

Acidifying agents- Dilute Hydrochloric acid.

Antacids- Sodium bicarbonate, Aluminum hydroxide gel, Aluminum phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations. Protective and Adsorbents- Bismuth sub carbonate and Kaolin.

Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

Unit III: Topical Agents

8 Hours

Protective- Talc, Zinc Oxide, Calamine, Zinc stearate, Titanium dioxide, silicone polymers.

Antimicrobials and Astringents- Hydrogen peroxide*, Potassium permanganate, Chlorinated lime, Iodine, Solutions of Iodine, Povidone-iodine, Boric acid, Borax, Silver nitrate, Mild silver protein, Mercury yellow, Mercuric oxide, Ammoniated mercury, Sulphur and its compounds- Sublimed sulphur, Precipitated sulphur, Selenium sulphide.

Astringents- Alum and Zinc Sulphate.

Unit IV: Dental Product

8 Hours

Dental Products- Sodium fluoride, Stannous fluoride, Calcium carbonate, Sodium meta phosphate, Dicalcium phosphate, Strontium chloride, Zinc chloride.

Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

Unit V:

7 Hours

Respiratory stimulants- Ammonium carbonate.

Expectorants and Emetics- Ammonium chloride*, Potassium iodide, Antimony potassium tartrate.

Antidotes- Sodium nitrite.

Unit VI: Major Intra and Extra cellular electrolytes 8 Hours
Major Intra and Extra cellular electrolytes- Electrolytes used for replacement therapy- Sodium chloride and its preparations, Potassium chloride and its preparations. Physiological acid-base balance and electrolytes used- Sodium acetate, Potassium Acetate, Sodium bicarbonate Inj., Sodium citrate, Potassium citrate, Sodium lactate injection, Ammonium chloride and its injection, Combination of oral electrolyte powders and solutions.
Unit VII: Inorganic official compounds 7 Hours
Inorganic official compounds of Iron, Iodine and Calcium, Ferrous Sulphate and Calcium Gluconate.
Unit VIII: Radio pharmaceuticals and contrast media 7 Hours
Radio activity-Alpha; Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity, G.M. Counter, Radio isotopes-their uses, Storage and precautions with special reference to the official preparations. Radio opaque contrast media- Barium sulfate.
Unit IX: Quality control of Drugs and Pharmaceuticals 7 Hours
Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for Arsenic, Chloride, Sulfate, Iron and Heavy metals.
Unit X: Identification tests 5 Hours
Identification tests for cations and anions as per Indian Pharmacopoeia.
Unit XI: Hours
Advances in Pharmaceutical Chemistry-I • Radiopharmaceuticals used for drug discovery and development. • Inorganic compounds used in pharmaceutical preparations. • Metallic compounds used in pharmaceutical preparations.
1. https://www.drugs.com/pro/water-for-injection.html 2. WHO Guidelines.. https://www.who.int/medicines/areas/quality_safety/quality_assurance/QAS19_786

3. Radiopharmaceuticals: Drug Development and Regulatory Issues. https://link.springer.com/chapter/10.1007/978-3-540-76735-0_20
4. Radioactive Drugs in Clinical Medicine. https://www.iaea.org/sites/default/files/15205681319.pdf
5. https://www.researchgate.net/publication/267961271_Metal-Based_Drugs_Current_Use_and_Future_Potential
6. Introduction to pharmaceutical inorganic chemistry. http://www.bspublications.net/downloads/059c4987a9551e_Ch-1_Pharmaceutical%20Inorganic%20Chemistry_2nd%20Ed._Algarsamy.pdf
7. Medicinal Uses of Inorganic Compounds - 1. https://www.ias.ac.in/article/fulltext/reso/011/04/0075-0090 . https://images.static-collegedunia.com/public/college_data/images/entrance/entrance_brochure/1476547755x.pdf

Suggested Reading

- 1.
- 2.
- 3.
- 4.

Name of The Course	Pharmacognosy			
Course Code	DPHT 1003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

The basic objective of this course is to get familiar with Pharmacognosy, active constituents, phytochemical screening etc.

Course Outcomes

The student shall be able to

CO1	Demonstrate and interpret the different indigenous system of medicines, related drugs and also able to analyze the adulteration and quality control parameters as per Pharmacopoeia standards.
CO2	Apply the different tests and techniques for identification and isolation of therapeutic important category of compounds.
CO3	Relate and generalize the importance of Pharmaceutical aids.
CO4	Apply the knowledge of occurrence, distribution, organoleptic evaluation, chemical tests and therapeutic efficacy of various categories of drugs.
CO5	Apply the knowledge of identification,

	preparation and gross anatomical studies of various drugs.
CO6	Evaluate the Ayurvedic Preparation methods & Crude drug monograph and justify their importance in registration of drugs.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	-	80	100

Course Content:

Unit I	15 Hour
Definition, history and scope of Pharmacognosy including indigenous system of medicine. Various systems of classification of drugs and natural origin. Adulteration and drug evaluation; significance of Pharmacopoeial standards.	
Unit II	15 Hours
Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.	
Unit III	7 Hours
Pharmaceutical aids Honey, Arachis oil, starch, kaolin, pectin, olive oil. Lanolin, Beeswax, Acacia, Tragacanth, sodium Alginate, Agar, Guar gum, gelatin. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs. (a) Laxatives- Aloes, Rhubarb, Castor oil, Ispaghula, Senna. (b) Cardiotonics- Digitalis, Arjuna. (c) Carminatives & G.I. regulators- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper, Asafoetida, Nutmeg, Cinnamon, Clove.	
Unit IV	15 Hours
Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs. (d) Astringents- Catechu. (e) Drugs acting on nervous system- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux -vomica.	

(f) Antihypertensive- Rauwolfia.
(g) Antitussives- Vasaka, Tolu balsam, Tulsi.
(h) Antirheumatics- Guggal, Colchicum.
(i) Antitumour- Vinca.
(j) Antileprotics- Chaulmoogra oil.
(k) Antidiabetics- Pterocarpus, Gymnema sylvestro.
(l) Diuretics- Gokhru, Punarnava.
(m) Antidysenterics- Ipecacuanha.
(n) Antiseptics and disinfectants- Benzoin, Myrrh, Neem, Curcuma.
(o) Antimalarials- Cinchona.
(p) Oxytocics- Ergot.
(q) Vitamins- Shark liver oil and Amla.
(r) Enzymes- Papaya, Diastase, Yeast.
(s) Perfumes and flavoring agents- peppermint oil, Lemon oil, Orange oil, lemon grass oil, sandal wood.
Unit V 15 Hours
Miscellaneous- Liquorice, Garlic, picrorhiza, Dirscorea, Linseed, shatavari, shankpushpi, pyrethrum, Tobacco.
Collection and preparation of crude drugs for the market as exemplified by Ergot, opium, Rauwalfia, Digitalis, senna.
Study of source, preparation and identification of fibers used in sutures and surgical dressings- cotton, silk, wool and regenerated fibers.
Gross anatomical studies of- senna, Datura, cinnamon, cinchona, fennal, clove, Ginger, Nuxvomica & Ipecacuanha.
Unit VI:
8 Hours
Ayurvedic Pharmacy: Introduction , Market Potential, Ayurvedic preparations: Arishta, Asava, Gutika, Tailas, Churnas, Bhasma, Lehyas.
Introduction to crude drug monograph and its importance in registration of herbal drug.

Suggested Reading

Text Book

1. Kokate C.K., Gokhale AS, Gokhale SB, Cultivation of Medicinal Plants, Nirali Prakashan.
2. Kokate C.K., et al, Pharmacognosy, Nirali Prakashan, Pune.
3. Wallis. T.E., Text Book of Pharmacognosy, J&A Churchill Ltd. London.
4. Tyler V.E. et al, Pharmacognosy, Lea &Febiger, Philadelphia.
5. Shah B, Seth AK. Pharmacognosy & Phytochemistry. CBS Publishers & Distributors Pvt. Ltd.

Reference Books

1. Indian Herbal Pharmacopoeia, Vol. I&II, ICMR & RRL., Jammu.
2. Nadkarni A.K., Indian Materia Medica 1-2, Popular Prakashan (P) Ltd. Bombay.
3. Medicinal Plants of India I&II, Indian council of Medical Reasearch, New Delhi.

CO1	The student will be able to understand fundamental biochemical principles of proteins and their importance to maintain healthy life
CO2	The student will be able to understand the basics of carbohydrates biomolecules and analyze the presence of carbohydrates, metabolic pathway and disease
CO3	The student will be able to understand basics of lipids, their identification and metabolites causing disease
CO4	The student will be able to understand importance of vitamins, minerals and chemistry involved in enzyme action with various factors affecting their activity.
CO5	The student will be able to understand pathogenesis of diseases due to presence of unwanted metabolites, abnormal cells and their cell count in biological samples.

Name of The Course	Biocgemistry and clinical Pathology(Theory)			
Course Code	DPHT1004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course, the students shall be able to understand:

1. Apply fundamental biochemical principles of proteins and their importance to maintain healthy life
2. Illustrate the basics of carbohydrates biomolecules and analyze the presence of carbohydrates, metabolic pathway and disease
3. Illustrate the basics of lipids, their identification and metabolites causing disease
4. Analyze the importance of vitamins, minerals and chemistry involved in enzyme action with various factors affecting their activity.
5. Analyze the pathogenesis of diseases due to presence of unwanted metabolites, abnormal cells and their cell count in biological samples.

Course Outcomes

Course Content:

Unit I: 10 Hours
Proteins
Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.
Unit II: 10 Hours
Carbohydrates
Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.
Unit III: 10 Hours
Lipids
Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids

metabolism
Unit IV 10 Hours
Vitamins
Vitamins: Brief chemistry and role of vitamins and coenzymes. Role of minerals and water in life processes. Enzymes: Brief concept of enzymatic action. factors affecting it
Unit V: 10 Hours
Therapeutics
Introduction to pathology of blood and urine. Lymphocytes and platelets, their role in health and disease. Erythrocytes-Abnormal cells and their significance. Abnormal constituents of urine and their significance in diseases.

Course Objectives

1. Identify different types of cells and organelles describe their functions.
2. Identify the three types of muscle and describe the muscular system's functions.
3. Identify the major components of the nervous system and describe their functions.
4. Identify the major components of the endocrine system and describe their functions.
5. Identify the major components of the circulatory system and describe their functions.

Course Outcomes

CO1	Illustrate the basic concepts of anatomy and physiology to identify cell, tissues and cardiovascular functions and its diseases.
CO2	Interpret the elements of respiratory and urinary system.
CO3	Demonstrate the anatomy and functions of muscular and central nervous system.
CO4	Illustrate anatomy and physiology of sensory and digestive system.
CO5	Interpret the structure, and physiology of reproductive and endocrine system
CO6	Illustrate the role of kidney in Blood Pressure and pH.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
0	20	80	100

Course Content:

Unit I: Scope of Anatomy and physiology. 10 Hours
Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes. Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue. Skeletal System: Structure and function of Skelton .Classification of joints and their function.

Name of The Course	Human Anatomy and Physiology			
Course Code	DPHT1005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Joint disorders.	
Unit II: Cardiovascular System	10 Hours
Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart. Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.	
Unit III: Respiratory system	07 Hours
Various parts of respiratory system and their functions, physiology of respiration.	
Unit IV: Urinary System	07 Hours
Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema	
Unit V: Muscular System	07 Hours
Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. Physiology of neuromuscular junction.	
Unit VI: Central Nervous System	07 Hours
Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.	
Unit VII: Sensory Organs	07 Hours
Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain	
Unit VIII: Digestive System	07 Hours
Names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.	
Unit IX: Endocrine System	07 Hours
Endocrine glands and Hormones. Location of glands, their hormones and functions. Pituitary, thyroid. Adrenal and pancreas	
Unit X: Reproductive system	06 Hours

Physiology and Anatomy of Reproductive system

Unit XI: Role of Kidney in Blood pH and Blood Pressure

Introduction, physiology, pathophysiology, Drug used in hypertension

Suggested Reading

1. **Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MI USA.**
2. **Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.**
3. **Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata.**
4. **Difore S.H. "Atlas of Normal Histology" – Lea &Febiger Philadelphia.**

Name of The Course	Health Education & Community Pharmacy			
Course Code	DPHT1006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	3

Course Objectives

1. **To understand concept of health and nutrition**
2. **To understand environmental health sciences.**
3. **To understand fundamental principles of microbiology**
- 4 **To understand signs and Symptoms, causative organism, mode of transmission, pathogenesis of communicable and non – communicable diseases.**

Course Outcomes

CO1	Analyze the concept of health and nutrition for
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	the prevention and control of diseases as well as they will analyze the concept of family planning
CO2	Apply the knowledge of first aid to come over the emergencies situation as well as they will also apply the knowledge of environmental health science to prevent and control of air, soil and water borne diseases.
CO3	Understand the fundamental principle of microbiology and causative agents, mode of transmission and prevention of communicable diseases.
CO4	Apply the concept to prevent and control of Intestinal infection, arthropod borne infections, surface infection and sexually transmitted diseases
CO5	The stApply knowledge of causative agents, prevention, care and control of communicable and infectious diseases.
CO6	The students will be able to Apply knowledge of causative agents, prevention, care and control of communicable and infectious diseases of moden erra

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
0	20	80	100

Course Content:

Unit I: Concept of health and Demography and family planning 10 Hours
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<p>Definition of physical health, mental health, social health, spiritual health determinants of health, indicator of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.</p> <p>Nutrition & Health Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.</p> <p>Demography and family planning: Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.</p>
<p>Unit II: First aid and Environment and health</p> <p>10 Hours</p> <p>Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings. Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control. rodents, animals and diseases</p>
<p>Unit III: Fundamental principles of microbiology and diseases</p> <p>10 Hours</p> <p>Classification of microbes, isolation, staining techniques of organisms of common diseases Communicable diseases Causative agents, mode of transmission and prevention. Respiratory infections-chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.</p>
<p>Unit IV : Intestinal infection and Arthropod borne infections</p> <p>10 Hours</p> <p>Poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection, plague, Malaria, filariases. Surface infection- Rabies, Trachoma, Tetanus, Leprosy.</p>

Sexually transmitted diseases-Syphilis, Gonorrhoea, AIDS
Unit V: Non-communicable diseases
13 Hours
causative agents, prevention, care and control, cancer, diabetes, blindness, cardiovascular diseases. Epidemiology: Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for-faces, urine, sputum, room linen, dead-bodies, instruments
Unit VI : 8 Hours
Introduction to covid 19.
References: Social Pharmacy: Tayler, Geoffery. Pharmaceutical Press. London S. Khurana, P Suresh and R Kalsi. Health Education & Community Pharmacy. S Vikas & Co Community Pharmacy Handbook- Jonathan Waterfield

Suggested Reading

1. Innovation and development Ltd. Geoff Harding, Sarah Nettleton and Kevin Taylor. The Pharmaceutical Press

2. Text Book of Community Pharmacy Practice. RPSGB Publication

3. Community Pharmacy Handbook- Jonathan Waterfield

4. S. Khurana, P Suresh and R Kalsi. Health Education & Community Pharmacy. S Vikas & Co

Name of The Course	Pharmaceutics -I Practical			
Course Code	DPHP1051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

List of Experiments:

- 1 To perform size reduction of given sample by ball mill.
- 2 To perform the size separation of given sample by sieving method
- 3 To prepare and submit calcium carbonate granules by wet granulation technique.

4 To evaluate the granules of calcium carbonate for flow properties.

5 To study the effect of additives on the flow properties of calcium carbonate granules.

6 To prepare and evaluate calcium carbonate tablets.

7 To evaluate the given marketed tablets.

8 To prepare and evaluate sodium chloride tablets by direct compression technique.

9 To perform the mixing of given powder by double cone blender.

10 To perform the simple distillation.

11 To perform the separation of two miscible liquids by simple distillation.

12 To perform the sterilization by dry heat method.

13 To perform sterilization by moist heat.

14 To evaluate the packaging materials and containers.

15 To perform the aseptic transfer of microbiological samples in lamminar flow bench.

16 To study the operation of manual capsule filling machine.

17 To study the effect of concentration on the rate of filtration.

18 To study the effect of filter media on the rate of filtration.

19 To study the effect of filter aid on the rate of filtration.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	Pharmaceutical Chemistry-II			
Course Code	DPHP1052			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

- Students should understand different acids, bases, antioxidants, inorganic drugs and Pharmaceuticals
- Students should understand the medicinal and Pharmaceutical importance of compounds.
- Students should know the methods of assay of pharmaceuticals.
- Students should know the methods to check limits of impurities in pharmaceuticals.

Course Outcomes

CO1	Students will be able to prepare & analyze the drug samples for identification.
CO2	Students will be able to analyze the drug samples to check the limits of important ions.
CO3	Students will be able to analyze the purity of drug samples by acid-base & redox titrations.
CO4	Students will be able to analyze the purity of drug samples by precipitation titrations.
CO5	Students will be able to apply chemical tests for

quality control of drugs and identification tests of cations and anions.
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Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam (MTE)	End Term Exam (ETE)	Total Marks
0	20	80	100

18. To carry out identification tests with the given sample of caffeine.
19. To prepare and standardize 0.1 M Iodine Solution by the aid of Sodium Thiosulphate.
20. To determine the volume strength of hydrogen peroxide solution.
21. To determine calcium by standardized EDTA solution.
22. To determine magnesium by standardized EDTA solution.
23. To carry out identification tests with the given sample of caffeine.
24. To prepare and standardize 0.1 M Iodine Solution by the aid of Sodium Thiosulphate.
25. To determine the volume strength of hydrogen peroxide solution.

Course Content:

Unit I: General discussion 8 Hours
<ol style="list-style-type: none"> 1. To perform the Limit Test for Chloride of the given sample 2. To perform the Limit Test for Sulphate of the given sample. 3. To perform the Limit Test for Iron of the given sample. 4. To perform the Limit Test for Lead of the given sample. 5. To perform the Limit Test for Heavy metals of the given sample. 6. To perform the Limit Test for Arsenic of the given sample. 7. To prepare and submit Calcium carbonate and calculate its percentage yield. 8. To prepare and standardize 0.1 N HCl using Sodium hydroxide. 9. To prepare and standardize 0.1 N Oxalic acid using Sodium hydroxide. 10. To prepare and standardize 0.1 N NaOH. 11. To prepare and submit Zinc sulphate and calculate its percentage yield. 12. To prepare and submit Alum and calculate its percentage yield. 13. To perform iodometric determination of available chlorine in a sample of bleaching powder. 14. To determine the amount of chloride in given sample using Mohr's method. 15. To determine the amount of chloride in given sample using Mohr's method. 16. To determine calcium by standardized EDTA solution. 17. To determine magnesium by standardized EDTA solution.

Suggested Reading

1. United States Pharmacopoeia (National Formulary).
2. Remington – “The science and practice of pharmacy” Vol. I & II. Mack Publishing Co., Pennsylvania
Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University

Name of The Course	PHARMACOGNOSY Practical			
Course Code	DPHP1053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

LIST OF EXPERIMENTS:

- | | | | |
|----|---|----|--|
| 1 | To study the compound microscope. | 12 | To determine the Stomatal Index of the given samples. |
| 2 | To study the morphological characteristics of Datura and Clove. | 13 | To determine the Palisade ratio in the given samples. |
| 3 | To study the morphological characteristics of Garlic, Aloe | 14 | To determine the Vein-islet number in the given samples. |
| 4 | To study the morphological characteristics of Lemon peel, Bitter orange peel. | 15 | To determine the vein termination number in the given samples. |
| 5 | To study the morphological characteristics of Coriander and Fennel. | 16 | To perform different chemical test in the given samples. |
| 6 | To study the morphological characteristics of Caraway, Black Pepper. | 17 | To determine the swelling factor of the given samples. |
| 7 | To study the morphological characteristics of Liquorice and Cardamom. | 18 | To study the fibres absorbent: Cotton, and wool along with their chemical tests. |
| 8 | To prepare different types of starch from the given samples. | 19 | To study the microscopy of Clove. |
| 9 | To study the morphological characteristics of potato, rice starch. | 20 | To study the transverse section of Nux-vomica seed. |
| 10 | To perform microscopic measurement of the potato and rice starch grains in the given samples. | | |
| 11 | To determine the Stomatal number of the given samples. | | |

- 21 To study the transverse section of Senna leaf.
- 22 To study the microscopy, powder microscopy, and chemical test of Fennel.
- 23 To study the microscopy, powder microscopy and chemical test of Caraway.
- 24 To study the microscopy, powder microscopy, and chemical test of Clove.
- 25 To study the microscopy, powder microscopy and chemical test of Cinnamon.
- 26 To study the microscopy, powder microscopy and chemical test of Zinger.
- 27 To perform the chemical test of Alkaloids.
- 28 To perform the chemical test of Glycosides
- 29 To perform the chemical test of Tannins.
- 30 To perform the chemical test of Saponins.
- 31 To perform Thin Layer Chromatography and to determine the Rf value of the given sample.
- 32 To perform the chemical test of Glycosides.
- 33 Determination of Loss on drying of the given samples.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	Clinical Biochemistry & Pathology Practical			
Course Code	DPHT1054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

LIST OF EXPERIMENTS

- 1 Qualitative analysis of Glucose and Fructose
- 2 Qualitative analysis of Lactose and Maltose
- 3 Qualitative analysis of Sucrose and starch
- 4 Identification tests for Proteins albumin and casein
- 5 Identification test for Lipids
- 6 To perform TLC for amino acids
- 7 To perform paper chromatography for amino acids
- 8 Qualitative analysis of urine for presence of glucose, urea, creatine
- 9 Determination of blood creatinine

10 Determination of blood sugar and serum total cholesterol

11 Preparation of acid buffer solution and measurement of pH

12 Preparation of basic buffer solution and measurement of pH

13 Examination of sputum and faeces by microscope

14 Practice in injecting drugs by intramuscular, subcutaneous

15 Practice in injecting drugs by intravenous routes and withdrawal of blood samples.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	Human Anatomy and Physiology Practical
Course Code	DPHT1055
Prerequisite	
Corequisite	

Antirequisite				
	L	T	P	C
	0	0	2	1

List of Experiments

- | | |
|---|---|
| <p>1 To study the compound microscope</p> <p>2 To study the human appendicular skeleton</p> <p>3 To study the bones of human skull</p> <p>4 To study the bones of thoracic cage of human body</p> <p>5 To study the integumentary and special senses using specimen models.</p> <p>6 To study the nervous system using specimen and models</p> <p>7 To study the endocrine system using specimens and models</p> <p>8 To demonstrate the function of olfactory nerve.</p> <p>9 To examine the different types of taste</p> <p>10 To study the structure and function of digestive system</p> <p>11 To study the structure and function of cardiovascular system</p> | <p>12 To study the structure and function of urinary system</p> <p>13 To study the structure and function of reproductive system</p> <p>14 To study the microscopic examination of skeletal and smooth muscle.</p> <p>15 To study the microscopic examination of epithelial tissue.</p> <p>16 To study the microscopic examination of connective tissue.</p> <p>17 To study the microscopic examination of nervous tissue and cardiac muscle.</p> <p>18 To determine the amount of haemoglobin in human blood sample.</p> <p>19 To find out the bleeding time of our own blood sample.</p> <p>20 To find out the clotting time of our own blood sample.</p> <p>21 To estimate the RBC count in our blood by hemocytometer.</p> <p>22 To estimate the WBC count in our blood by hemocytometer</p> <p>23 Determination of erythrocyte sedimentation rate (ESR)</p> <p>24 To determine the blood pressure of your body by sphygmomanometer</p> <p>25 To record the self body temperature</p> |
|---|---|

26 To record the pulse rate.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	Pharmaceutics-II			
Course Code	DPHT2001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. Students will be exposed to different methods for dose calculation of various dosage forms..
2. Students also able to know about various applications according to the prescriptions, formulation and manufacturing aspects of different dosage forms, evaluation of pharmaceutical dosage

Course Outcomes

CO1	The student will be able to Read and understand prescriptions and dose calculations for different age groups.
CO2	The student will be able to understand the formulation and manufacturing aspects of powders and monophasic liquids.
CO3	The student will be able to understand the formulation and manufacturing aspects of biphasic liquids e.g. suspensions and emulsions.
CO4	The student will be able to understand formulation and manufacturing aspects of semisolid dosage forms e.g. ointments, pastes,

	jellies, suppositories and pessaries.
CO5	The student will be able to understand formulation and manufacturing aspects of dental and sterile dosage forms.
CO6	The student will be acknowledge about how to design and make up different oral controlled and sustained drug delivery system

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam (MTE)	End Term Exam (ETE)	Total Marks
	20	80	100

Course Content:

Unit I: Prescriptions, Incompatibilities in prescriptions, Posology
12 Hours

Prescriptions-Reading and understanding of prescriptions; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.

Incompatibilities in prescriptions- study of various types of incompatibilities-physical, chemical and therapeutic. Posology- Dose and dosage of drugs, factors influencing dose, calculations of doses on the basis of age, sex, surface area and veterinary doses.

Unit II: Dispensed Medications, Powders, Liquid oral Dosage forms **15 Hours**

Dispensed Medications: (Note: A detailed study of the following dispensed medication is necessary. Methods of preparation with theoretical and practical aspects, use of appropriate containers and closures. Special labeling requirements and storage conditions should be highlighted).

Powders-Type of powders-Advantages and disadvantages of powders, Granules, cachets and tablet triturates. Preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance. Monophasic-Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, colorants and flavors, with examples.

Review of the following monophasic liquids with details of formulation and practical methods. Liquids for internal administration Liquids for external administration or used on mucous membranes

Mixtures and concentrates, Gargles Syrups, Mouth washes Throat-paints, Elixirs Douches, Ear Drops, Nasal drops Sprays, Liniments, Lotions.
Unit III: Emulsion and Biphasic liquid dosages form
14Hours
Suspensions (elementary study)-Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvant used like thickening agents, wetting agents, their necessity and quantity to be incorporated, suspensions of precipitate forming liquids like tinctures, their preparations and stability. suspensions produced by chemical reaction. An introduction to flocculated /non-flocculated suspension system. Emulsions-Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agent. Instabilities in emulsions, preservation of emulsions.
Unit IV: Semi-Solid Dosage Form, Trituration fusion chemical reaction Emulsification, Suppositories
18 Hours
Ointments: Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes: Trituration fusion chemical reaction Emulsification. Pastes: Differences between ointments and pastes, Bases of pastes. Preparation of pastes and their preservation. Jellies: An introduction to the different types of jellies and their preparation. An elementary study of poultice. Suppositories and passaries-Their relative merits and demerits, types of suppositories, suppository bases, classification, properties. Preparation and packing of suppositories. Use of suppositories of drug absorption..
Unit V: Dental and cosmetic preparations, Sterile Dosage form, Sterility testing
7 Hours
Dental and cosmetic preparations: Introduction to Dentifrices, facial cosmetics, Deodorants. Antiperspirants, shampoo, Hair dressings and Hair removers. Sterile Dosage forms:

Kulwer publizing house.

Parenteral dosage forms-Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvant, processing and parenterals, Facilities and quality control. Preparation of Intravenous fluids and admixtures-Total parenteral nutrition, Dialysis fluids. Sterility testing: particulate matter monitoring- Faculty seal packaging. Ophthalmic products: 1 Formulation: additives, special precautions in handling and storage of ophthalmic products.
Unit VI: Controlled, delayed or sustained release drug delivery system
8 Hours
Introduction to modified ideal drug delivery system with special reference to controlled and sustained type system, About Modified dosages form, Detail on controlled release drug delivery system, Classification of controlled drug delivery system: Sustain release, Extended release and delayed release formulation, Detail on sustain release drug delivery system, Preparation Methodology of modified drug delivery system, Equipment used for controlled and sustained drug delivery system, Different marketed formulation of controlled and sustained type drug delivery system, Application in pharmacy of modified drug delivery system

Suggested Reading

1. Carter S.J., "Cooper and Gunn's Tutorial Pharmacy", CBS Publishers, Delhi.
2. LachmanL, Liberman H.A and Kanig J.L., "Theory and Practice of Industrial Pharmacy", Lea and Febiger.
3. Remington - "The science and practice of pharmacy" Vol. I & II. Mack Publishing Co., Pennsylvania.
4. S.P. Vyas, R. K. Khar, Targetted and controlled drug delivery, CBS Publisher & Distributors.
5. Aulton, M.E, Text Book of Pharmaceutics, Vol., I & II. Churchill Livingstone.
6. Loyd V. Elen, Pharmaceutical dosages form and drug delivery system, Seventh edition, Wolters

Name of The Course	Pharmaceutical Chemistry-I			
Course Code	DPHT2002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	3

Course Objectives

1. To apply knowledge in basic Clinical Laboratory Practice
2. To get knowledge of laboratory setup and organization
3. To follow the laboartorty ethics and giving accurate results.

Course Outcomes

CO1	The students will be able to understand properties and medicinal uses of antiseptics, disinfectants, sulfonamides and antimycotic drugs.
CO2	The students will be able to understand the chemistry of steroids, antiamoebics, anthelmintics, analgesics and antibiotics.
CO3	The students will be able to understand the chemistry of drugs acting on CNS, adrenergic and cholinergic system.
CO4	The students will be able to understand the chemistry of drugs acting on CVS, urinary system blood coagulation and histamine receptors.
CO5	The students will be able to understand the chemistry of drugs acting on CNS, CVS and cancer cells
CO6	The students will be able to understand about compitor added drug design.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
0	20	80	100

Course Content:

Unit I: Antiseptics and Disinfectants, Antileprotic Drugs	16 Hours
Proflavine*, Benzalkonium chloride, Cetrimide, Phenol, chloroxylenol, Formaldehyde solution, Hexachlophene, Nitrofurantoin. Sulphonamides- Sulphadiazine, Sulphaguanidine, Phthalylsulphathiazole, Succinylsulphathiazole, Sulphadimethoxine, Sulphamethoxyipyridazine, Co-trimoxazole,	

sulfacetamide* Antileprotic drugs- Clofazimine ,Thiambutosine, Dapsone*, solapsone, Anti-tubercular Drugs- Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, cycloserine, pyrazinamide*.
Unit II: Steroidal Drugs, Analgesics and Anti-pyretics- 14 Hours
Betamethasone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone. Antimoebic and Anthelmintic Drugs- Emetine, Metronidazole, Halogenated hydroxyquinolines, Diloxanidefuroate, Paromomycin ,Piperazine*, Mebendazole, D.E.C.* Analgesics and Anti-pyretics- Morphine, Pethidine, Codeine, Mathadone, Aspirin*, Paracetamol, Analgin, Dextropropoxphene, Pentazocine. Antibiotics- Benzyl penicillin*, Phenoxy methyl penicillin*, Benzathine penicillin, Ampicillin*, Cloxacillin, Carbencicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.
Unit III: Tranquilizers, Hypnotics- 18 Hours
Tranquilizers- Chlorpromazine*, Prochlorperazine, Trifluoperazine, Thiothixene, Haloperidol*, Triperidol, Oxypertine, Chlordizepoxide, Diazepam*, Lorazepam, Meprobamate. Hypnotics- Phenobarbitone*, Butobarbitone, Cylobarbitone, Nitrazepam, Glutethimide*, Methyprylon, Paraldehyde, Triclofosodium. General Anaesthetics- Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopecalsodium, Trichloroethylene . Antidepressant Drugs- Amitriptyline, Nortriptyline, Imperamine*, Phepeline, Tranylcypramine. Analeptics- Theophylline, Caffeine*, Coramine*, Dextro-amphetamine. Adrenergic drugs- Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine, Salbutamol, Terbutaline, Ephedrine*, Pseudoephedrine. Adrenergic antagonist- Tolazoline, Propranolol*, Practolol. Cholinergic Drugs- Neostigmine*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine*. Cholinergic Antagonists- Atropine*, Hyoscine, Homatropine, Propantheline*, Benztropine, Tropicamide, Biperiden*.
Unit IV : Diuretic Drugs, Cardiovascular Drugs
14 Hours
Diuretic Drugs- Furosemide*, Chlorothiazide, Hydrochlorothiazide*, Benzthiazide, Urea*, Mannitol*, Ethacrynic Acid. Cardiovascular Drugs- Ethylnitrite*, Glyceryltrinitrate, Alpha methyl dopa, Guanethidine, Clofibrate, Quinidine. Hypoglycemic Agents- Insulin, Chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin*, Metformin. Coagulants and Anti coagulants- Heparin, Thrombin, Menadione*, Bisphydroxy-coumarin, Warfarin sodium. Local Anaesthetics- Lignocaine*, Procaine*, Benzocaine,

Histamine and anti Histaminic Agents- Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine*, Pheniramine, Chlorpheniramine*.
Unit V: Structures
13 Hours
Non-steroidal anti-inflammatory agents- Indomethacin*, Phenylbutazone*, Oxyphenbutazone, Ibuprofen. Thyroxine and Antithyroids- Thyroxine*, Methimazole, Methyl thiouracil, Propylthiouracil. Diagnostic Agents- Lopanoic Acid, Propylidone, Sulfobromophthalein-sodium, Indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein sodium. Anticonvulsants, cardiac glycosides, Antiarrhythmic, Antihypertensives & Vitamins. Anti-Neoplastic Drugs- Actinomycin, Azathioprine, Busulphan, Chloramubucil, Cisplatin, Cyclophosphamide, Daunorubicin Hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin
Unit VI : 8 Hours
Introduction to computer added Drug Design: QSAR, 3D-QSAR, Molecular docking study, Ligands etc.
References: Madsen U, Krosgaard-Larsen P, Liljefors T (2002). <i>Textbook of Drug Design and Discovery</i> . Washington, DC: Taylor & Francis. ISBN 978-0-415-28288-8 . Wu-Pong S, Rojanasakul Y (2008). <i>Biopharmaceutical drug design and development</i> (2nd ed.). Totowa, NJ Humana Press: Humana Press. ISBN 978-1-59745-532-9

Suggested Reading

- 1.
- 2.
- 3.
- 4.
- 5.

Name of The Course	Pharmacology and Toxicology			
Course Code	DPHT2003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	3

Course Objectives

- 1. To apply knowledge in basic Clinical Laboratory Practice**
- 2. To get knowledge of laboratory setup and organization**
- 3. To follow the laboratory ethics and giving accurate results.**

Course Outcomes

CO1	Illustrate the scope of Pharmacology and general mechanism of drugs acting on CNS.
CO2	Interpret the mechanism of action and pharmacological actions of centrally acting muscle relaxants drugs, local anesthetics and drugs acting on ANS.
CO3	Illustrate the pharmacological actions of drugs acting on respiratory system, autacoids, cardiovascular system.
CO4	Illustrate the pharmacological actions of drugs acting on kidney, digestive system, hormones and hormonal antagonists.
CO5	Interpret the mechanism of action, pharmacological actions of chemotherapeutic agents, disinfectants and antiseptics.
CO6	Illustrate the CPCSEA Guidelines and Principles of animal toxicology Acute, sub acute and chronic toxicity.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
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0	20	80	100
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Course Content:

Unit I: Pharmacology and general mechanism of drugs acting on CNS.

16 Hours

Introduction to Pharmacology, scope of Pharmacology. Routes of administration of drugs, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them, Metabolism, distribution and excretion of drugs. General mechanism of drugs action and the factors which modify drug action. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspect:
 Drugs acting on the Central Nervous System:
 General anaesthetics, adjunction to anaesthesia, intravenous anaesthetics.
 Analgesic antipyretics and non-steroidal anti-inflammatory drugs, Narcotic analgesics, Antirheumatic and antigout remedies, Sedatives and Hypnotics, Psychopharmacological agents, anti convulsants, analeptics.

Unit II: Autonomic Nervous system **14 Hours**

General mechanism of drugs action and the factors which modify drug action. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspect:
 Centrally acting muscle relaxants and anti parkinsonism agents
 Local anaesthetics. Drug acting on autonomic nervous system.
 Cholinergic drug, Anticholinergic drugs, anti cholinesterase drugs.
 Adrenergic drugs and adrenergic receptor blockers.
 Neurones blockers and ganglion blockers.
 Neuromuscular blockers, drugs used in myasthenia gravis.
 Drugs acting on eye, mydriatics, drugs used in glaucoma.

Unit III: pharmacological actions of drugs acting on respiratory system, autacoids, cardiovascular system.

15 Hours

Drugs acting on respiratory system- Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

<p>Autocoids- Physiological role of histamine and serotonin, Histamine and Antihistamines, Prostaglandins. Drugs acting on respiratory system- Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.</p> <p>Autocoids- Physiological role of histamine and serotonin, Histamine and Antihistamines, Prostaglandins. Cardio Vascular drugs, Cardiotonics, Antiarrhythmic agents, Antianginal agents, Antihypertensive agents, Peripheral Vasodilators and drugs used in atherosclerosis.</p> <p>Drugs acting on the blood and blood forming organs. Haematinics, Coagulants and anti Coagulants, Haemostatics, Blood substitutes and plasma expanders. Propantheline*, Benztropine, Tropicamide, Biperiden*.</p>
<p>Unit IV: The pharmacological actions of drugs acting on kidney, digestive system, hormones and hormonal antagonists. 13 Hours</p>
<p>Drugs affecting renal function-Diuretics and antidiuretics.</p> <p>Hormones and hormone antagonists-hypoglycemic agents, Antithyroid drugs, sex hormones and oral contraceptives, corticosteroids.</p> <p>Drugs acting on digestive system-Carminatives, digestants Bitters, Antacids and drugs used in Peptic ulcer, purgatives, and laxatives, Antidiarrhoeals, Emetics, Antiemetics, Anti-spasmodics.</p> <p>Hormones and hormone antagonists-hypoglycemic agents, Antithyroid drugs, sex hormones and oral contraceptives, corticosteroids.</p>
<p>Unit V: Mechanism of action, pharmacological actions of chemotherapeutic agents, disinfectants and antiseptics. 17 Hours</p>
<p>Chemotherapy of microbial disease; Urinary antiseptics, Sulphonamides, Penicillins, Streptomycin, Tetracyclines and other antibiotics, Antitubercular agents, Antifungal agents, antiviral drugs, antileprotic drugs.</p> <p>Chemotherapy of protozoal diseases Anthelmintic drugs. Chemotherapy of cancer. Disinfectants and antiseptics.</p>
<p>Unit VI: Introduction to CPCSEA Guidelines and animal Toxicology. 8 Hours</p>
<p>Introduction to CPCSEA Guidelines. Principles of Animal toxicology Acute, sub acute and chronic toxicity</p>

Suggested Reading

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley

R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins

3. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.

4. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill

5. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.

Name of The Course	Pharmaceutical Jurisprudence			
Course Code	DPHT2004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Outcomes

CO1	Understand about Origin and nature of pharmaceutical legislation in India.
CO2	Understand the Principles and significance of professional Ethics.
CO3	Understand about the different provisions under Pharmacy Act, 1948.
CO4	Understand about the different provisions under Drugs and Cosmetics Act, 1940
CO5	Understand about the different provisions under The Drugs and Magic Remedies (objectionable Advertisement) Act, 1954
CO6	The students will be able to understand about Telepharmacy and epidemiological studies.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
0	20	80	100

Course Content:

Unit I: Origin and nature of pharmaceutical legislation in India 10 Hours

Origin and nature of pharmaceutical legislation in India, its scope and objectives, Evolution of the concept of pharmacy, Health care system, Latest Drugs (price control) order in force, Medicinal and Toilet preparations (excise Duties) Act, 1955 (as amended to date).

Unit II: Principles and significance of professional Ethics.

10 Hours

Principles and significance of professional Ethics. Critical study of the code of pharmaceutical Ethics drafted by pharmacy council of India, Medical Termination of Pregnancy Act, 1971(as amended to date). General study of the schedules with special reference to schedules C,C1,F,G,J,H,P and X and salient features of labeling and storage conditions of drugs.

Unit III: Pharmacy Act,1948

10 Hours

Pharmacy Act,1948-The General study of the pharmacy Act with special reference to Education Regulations ,Working of state and central councils, constitution of these councils and functions, Registration procedures under the Act ,Poisons Act 1919(as amended to date)

Unit IV : The Drugs and Cosmetics Act,1940 10 Hours

The Drugs and Cosmetics Act,1940-General study of the Drugs and cosmetics Act and the Rules there under ,Definitions and salient features related to retail and

Name of The Course	Drug Store & Business Management			
Course Code	DPHT2005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	3

Course Objectives

1. Students will be exposed to Trade, Industry and commerce, Importance of purchasing, tenders, contracts,

whole sale distribution of drugs, The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule, Facilities to be provided for running a pharmacy effectively.

Unit V: The Drugs and Magic Remedies (objectionable Advertisement)Act, 1954

10 Hours

The Drugs and Magic Remedies (objectionable Advertisement)Act, 1954-General study of the Act, objectives , special reference to be laid on Advertisements, magic remedies and objections1 and permitted advertisements -diseases which cannot be claimed to be cured.

Narcotic Drugs and psychotropic substances Act, 1985-A brief study of the act with special reference to its objectives, offences and punishment.

Unit VI : 5 Hours

Introduction: Recent laws in Pharmaceutical Sciences.

References: Remington – “The science and practice of pharmacy” Vol. I & II. Mack Publishing Co., Pennsylvania. Pharmacopoeia of India, The Controller of Publications, Delhi.

- 2. Students will be exposed to Inventory management and its techniques, Sales promotion, market research.
- 3. Students will be exposed to advertising, accounting concepts.
- 4 Students will be exposed to double entry book keeping, accounts, cash book, budgeting.

Course Outcomes

CO1	Student will be able to understand about Trade, Industry and commerce
CO2	Student will be able to understand about Importance of purchasing, tenders, contracts.
CO3	

	Student will be able to understand about Inventory management and its techniques.
CO4	Student will be able to understand about Sales promotion, market research, advertising
CO5	T Student will be able to understand about Accounting concepts, double entry book keeping, accounts, cash book, budgeting.
CO6	Students will be exposed to modern techniques of double entry book keeping, accounts, cash book, budgeting.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
0	20	80	100

Course Content:

Unit I: Introduction	10 Hours
Trade, Industry and commerce, Functions and subdivision of commerce, Introduction to Elements for Economics and Management. Forms of Business Organizations. Channels of Distribution methods, hormonal contraceptives, population problem of India	
Unit II: Drug House Management	15 Hours
Selection of site, space Lay-out and legal requirements. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements. Codification, handling of drug stores and other hospital supplies.	
Unit III: Inventory management	20 Hours
Inventory Control-objects and importance, modern techniques like ABC,VED analysis, the lead time, inventory carrying cost, safety stock, minimum and maximum stock levels, economic order quantity, scrap and surplus disposal	

Unit IV : Sales promotion, Recruitment, training, Banking and Finance- 20 Hours
Sales promotion, - Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display. Recruitment, training, evaluation and compensation of the pharmacist. Banking and Finance-Service and functions of bank, Finance planning and sources of finance
Unit V: Accountancy 20 Hours
Introduction to the accounting concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet. Simple techniques of analyzing financial statements. Introduction to Budgeting
Unit VI : 8 Hours
Introduction to the accounting concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet. Simple techniques of analyzing financial statements. Introduction to Budgeting
References 1. S.N. Maheshwari and Mittal “Financial accounting & corporate accounting” Vikas Publishers, Publishers, Delhi. 2.Khan& Jain, “Financial accounting & corporate accounting” Vikas Publishers, Publishers, Delhi.

Suggested Reading

1.S.N. Maheshwari and Mittal “Financial accounting & corporate accounting” Vikas Publishers, Publishers, Delhi.

2.Khan & Jain, “Financial accounting & corporate accounting” Vikas Publishers, Publishers, Delhi.

3. Francis chernaum "Trade documentation",
Excel Publishers, delhi

4. Lachman L, Liberman H.A and Kanig J.L., "Theory
and Practice of Industrial Pharmacy", Lea and
Febiger.

Name of The Course	Hospital and Clinical Pharmacy			
Course Code	DPHT2006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. To apply knowledge in basic Clinical Laboratory Practice
2. To get knowledge of laboratory setup and organization
3. To follow the laboratory ethics and giving accurate results.

Course Outcomes

CO1	Understand about the functions and objectives of hospital system and drug distribution system.
CO2	Understand about the pharmacy therapeutic committee, Hospital formulary system and manufacturing of sterile, non-sterile formulations
CO3	Understand about the drug information service, surgical dressing and applications of computers.
CO4	Understand about the modern dispensing aspects and common daily terminology used in practice of medicines
CO5	Understand about the drug interactions, adverse drug reactions, drugs in clinical toxicity, drug dependences and bioavailability of drugs.
CO6	Understand about essential drugs and its concept, Fixed Dose Drug combination (FDDC) and its concept, rational Drug Therapy Role of community pharmacist.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam (MTE)	End Term Exam (ETE)	Total Marks
	20	80	100

Course Content:

Unit I: Hospital Pharmacy & Drug Distribution
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system in Hospitals.	17 Hours
Hospital-Definition, Function, classifications based on various criteria, organization, Management and health delivery system in India. Hospital Pharmacy: Definition Functions and objectives of Hospital pharmaceutical services. Location, Layout, Flow chart of materials and men. Personnel and facilities requirements including equipments based on individual and basic needs. Requirements and abilities required for Hospital pharmacists.	
Drug Distribution system in Hospitals. Out-patient service, In-patient services- types of services detailed discussion of unit Dose system, Floor ward stock system, satellite pharmacy services, central sterile services, Bed side pharmacy.	
Unit II: Sterile manufacture & P.T.C. (Pharmacy Therapeutic Committee)	17 Hours
Manufacturing: Economical considerations, estimation of demand.	
Sterile manufacture-Large and small volume parenterals, facilities, requirements, layout production planning, man-power requirements. Non-sterile manufacture-Liquid orals, externals, Bulk concentrates. Procurement of stores and testing of raw materials. Nomenclature and uses of surgical instruments and Hospital Equipments and health accessories.	
P.T.C. (Pharmacy Therapeutic Committee) Hospital Formulary system and their organization, functioning, composition.	
Drug Information service and Drug Information Bulletin.	
Unit III: Surgical dressing & Application of computers	14 Hours
Understand about the drug information service, surgical dressing and applications of computers.	
Unit IV: Clinical pharmacy practice	11 Hours
Introduction to Clinical pharmacy practice- Definition, scope.	
Modern dispensing aspects- Pharmacists and patient counseling and advice for the use of common drugs, medication history.	
Common daily terminology used in the practice of Medicine.	

Disease, manifestation and Patho-physiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardiovascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.
Unit V: Physiological parameters with their significance 16 Hours
Drug Interactions: Definition and introduction. Mechanism of Drug Interaction. Drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents. Vitamins and Hypoglycemic agents. Drug-food interaction. Adverse Drug Reaction: Definition and significance. Drug-Induced diseases and Teratogenicity. Drugs in Clinical Toxicity- Introduction, general treatment of poisoning, systemic antidotes, Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organo-phosphorus poisons. Drug dependences, drug abuse, addictive drugs and their treatment, complications. Bio-availability of drugs, including factors affecting it.
Unit XI: Essential Drugs and its rational uses. 08 Hours
Introduction to Essential Drugs and its concept. Introduction to Fixed Dose Drug combination (FDDC) and its concept. Rational Drug Therapy Role of community pharmacist.

5. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India: CBS Publishers & Distributors; 2008.

Suggested Reading:

- 1. Merchant S.H. and Dr. J.S.Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.**
- 2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice-essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.**
- 3. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.**
- 4. Scott LT. Basic skills in interpreting laboratory data, 4th ed. American Society of Health System Pharmacists Inc; 2009.**

Name of The Course	Medical Sales Representative			
Course Code	DPHT2007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. To apply knowledge in basic English grammar.
2. To get knowledge of marketing research and healthcare ecosystem.
3. To get knowledge to maintain the coordination in market place.

Course Outcomes

CO1	Apply the knowledge of basic english grammar and basic of communication for English Speaking and Personality Development.
CO2	Apply Public speaking english for everyday communication to sell and promote medical products, pharmaceutical products and deliver presentations to doctors.
CO3	Apply the marketing and Healthcare Ecosystem knowledge to Perform the occupations effectively as per company’s standard guidelines as well as know the MCI Code of Conduct guidelines for MSR and UCP-MP Act.
CO4	Apply knowledge to ensure ensure smooth coordination among distribution system, marketing research, scientific data publication, and to establish establish contact with maximum people within and outside the company to gather inputs on arranging the conference.
CO5	Analyze the therapeutic drug classes and categories to prepare a suitable drug formulary and conduct orientation on pharmaceutical advancements.
CO6	Apply the knowledge of Employability and Entrepreneurship.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
0	20	80	100

Course Content:

Unit I: English Speaking and Personality Development. Basics of communication and Personality Development.

15 Hours

English Speaking and Personality Development
 Basics of communication
 - Introduction to communication
 - Building Vocabulary.
 - Sentence construction.
 Basic English Grammar
 - Noun, pronoun, Adjective, Verb, Tenses,
 - Preposition, Articles, Conjunction, Punctuation.
 - Grammar usage in sentences. Personality Development.
 - Manners & Etiquettes.
 - Building confidence and Personality developing presentation skills.
 - Dress code and color pattern.
 Interview skills
 Resume writing.
 - Interview question and answers.
 - Mock sessions.
 Core skills and professional skills related to gathering information about product and competitor
 To effectively gather information about the product and competitors know the required skill set and learn application of related Core Skills and Professional Skills like Reading, writing, listening and speaking, Critical thinking, problem solving, decision making, customer centricity, plan and organizing, Analytical thinking
 Pharmaceutical marketing
 To develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector; understand Role of Marketing across Product lifecycle; gain knowledge about trends in Pharmaceutical Marketing and implications of changing marketplace on promotional activities in Pharma and gain knowledge about Patient-Physician relationship and Physician-MSR relationship.

Unit II: Public speaking skills and Orientation with presales activities **15 Hours**

Public speaking skills
 - Extempore and Group discussion.
 - Email drafting, Business correspondence.
 - Avoiding spelling mistakes and mispronunciations. Letter writing practice.
 Speaking English for the real world
 - Everyday communication - Introduction, Shopping Meeting friends, Traveling, Visiting a doctor Telephonic communication, Negotiation, At the movie Theatre, at the office, Meeting relatives etc. Orientation with presales activities
 To sell and promote medical products and services and to arrange appointments with medical professionals gain orientation with Pre-Sales Activity in reference to Communication strategies

for products

To• deliver presentations to doctors, pharmacists and other potential customers , learn basics of effective business communication and learn how to conduct effective business meetings

Sales in life sciences

To sell and promote medical and pharmaceutical products and services learn basics of Selling Process.

To develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector understand different Sales Approaches in Pharma

To engage the potential customers using various methods, tolls and approaches to convince him/her to prescribe your products learn how to effectively handle Objections, basics of Emotional Quotient (EQ)

Unit III:

Orientation to reach sales and collection and Understand Role of MSR and code of conduct guidelines for MSR.

15 Hours

Maintain knowledge of key persons at hospitals, pharmacies and dealers, gain knowledge about the Overview of Healthcare Ecosystem including relevant Govt. Scheme, social security benefits, ESI, CGHS and Overview about Life Sciences Industry in Indian and Global Context which would enable him/her

• Stay informed about health and other relevant standards and the possible company's tie up with various regulatory bodies and authorities, know basic knowledge about Regulatory Authorities and Government Policies, rules and Regulations (CDSO/NPPA/ MRTP Act) and their impact on business dynamics, relevant to Life Sciences Industry

Perform the occupations effectively as per company's standard guidelines; gain orientation with Existing Organisation in Life Sciences Industry (in context of Large/Medium/ Small Enterprises): Their Organization Structure, Benefits and typical sales function in a Life Sciences organization and understand the Role of a MSR and required skills and knowledge (As per Qualification Pack) and its Career Path as well as know the MCI Code of Conduct guidelines for MSR and UCP-MP Act .

Unit IV:

Distribution system of pharmaceutical products and Organizing medical conferences and promotional events

15 Hours

Distribution system of pharmaceutical products.Maintain knowledge of key persons at hospitals, pharmacies and dealers and to ensure smooth coordination with product distribution related stakeholders; gain the understanding of Distribution System of Pharmaceutical Products and role of various stakeholders involved like CFA, Distributor, Stockist, and Liasoning Agents. Market research and Analysis and RCPA Monitor competitor's products and selling and promotional activities and gather current market information on pricing, new products, delivery schedules, promoting techniques, etc, know the techniques of Market Research

• Conduct the retail chemist prescription audit effectively and to

identify needs of potential customers by going through the prescriptions given by the doctors in the defined geography to their patients, know how to conduct and analyse retail call audits and how to use IT to Capture Market information and also gain the orientation with Physician and Pharmacist needs and working environment

Understanding of human body: Anatomy and physiology

Understand technical/ scientific data presentations and briefings about product and market, know the basics of general Anatomy and general Physiology, and learn various systems of the Human body in tandem with physiology of that organ and system as whole and Familiarise with medical specialities and their common diseases

Basic of pharmacology

Understand technical/ scientific data presentations and briefings and to understand and interpret clinical data supplied by company, learn fundamentals of pharmacology; understand related terms and their significance and understand basics of Drug metabolism

Overview of drug administration

Understand technical/ scientific data presentations and briefings and to understand and interpret clinical data supplied by company, know what is drug administration, How drug is transported within the Human Body, Mechanism of drug absorption mechanism in the Human body and know Methods of drug administration and various routes of drug administration .

To establish contact with maximum people within and outside the company to gather inputs on arranging the conference/ promotional event (CMEs) learn techniques for Collaborating with Other Groups and Divisions, understand the importance of collaboration for MSR

To• gain and spread knowledge from the event related to business/ brand/ company learn how to Identify Partnering Opportunities during meetings/ seminars

To• manage arrangements within the approved budget learn how to achieve Resource Optimisation at work

To• cover all important aspects related to the topic of the conference in the agenda/ theme of promotional event and to plan and complete all logistical arrangements to execution learn the application of Planning & Organizing Skills at work and learn how to effectively use Information Technology in organising conferences and events (CMEs).

Unit V: Therapeutics drug classes and catagories and Core skill professional skills related to organizing medical conferences and promotional events.

15Hours

Therapeutics drug classes and catagories

Understand technical/ scientific data presentations and briefings, know about the Therapeutic Drug Classes & Categories and their use in understanding the Product

Drug formularies ad their relevance for MSR

Understand technical/ scientific data presentations and briefings and to deliver convincing presentations to doctors, pharmacists and other potential customers gain knowledge about Drug Formularies and their relevance for MSR

Orientation on pharmacovigilance

Follow company's legal guidelines and pharmacovigilance process, know that what comprise the field of pharmacovigilance and its related fields, understand its relevance & potential for MSR's role, know common terms used and their reference, understand the scope of Pharmacovigilance as a system, know about National & International pharmacovigilance regulatory Authorities and learn basic processing of a typical pharmacovigilance case" through case studies.

Orientation of disease management

Understand technical/ scientific data presentations and briefings about product and market and to monitor the activities of health services in a specific area, learn the concept of disease management & Its Importance, know about process & factors influencing the disease management processes at gross level, gain knowledge for Disease management for common diseases and various projects being run Nationally and internationally

Organization policy and internal processes at work

Follow the company's guidelines, process and standard gain the orientation with generic Organizational Policy & various internal Process relevant for MSR

Organize Medical Conferences and promotional events (CMEs), by applying Core Skills and Professional Skills like Reading, writing, listening, speaking Analytical thinking, problem solving, decision making, customer centricity.

Information technology skills

Compile and analyse the reports and deliver presentations using Basic Computer operating Skills like Ms Office (Word, Excel, Power point and Outlook); know to work on Internet i.e. searching information on search engine, mail writing

To• communicate on email learn how to write mails

To• analyse the reports and deliver presentations how to compile office presentations, How to make the online sales reporting and facilitate the online product surveys

Unit VI: Employability and Entrepreneurship**Hours:8**

Introduction, Types of Business Activities, Values of an Entrepreneur, Attitude of an Entrepreneur, Coming up with a Business Idea, Understanding the Market, Business Planning

4. Secrets of Closing the Sale by Zig Ziglar.

Name of The Course	PHARMACEUTICS-II Practical			
Course Code	DPHT2051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

List of Experiments

- 1 Preparation and evaluation of topical emulsion.
- 2 Preparation and evaluation of topical suspension.
- 3 Preparation and evaluation of ointments.
- 4 Preparation and evaluation of sampoo.
- 5 Preparation of syrup solution Indian Pharmacopoeia.
- 6 Preparation of suppositories formulation.
- 7 Preparation and evaluation of topical emulsion.
- 8 Preparation of liniments.
- 9 Preparation of ear drop.
- 10 Preparation of eye drops solution.
- 11 Preparation of effervescent power.

Suggested Reading

1. **Mastering the Complex Sale Second Edition by Jeff Thull.**
2. **How to Master the Art of Selling by Tommy Hopkins.**
3. **How to Win Friends and Influence People by Dale Carnegie.**

- 12 Preparation of paste.
- 13 Preparation and mouth wash.
- 14 Preparation nasal drop.
- 15 Incompatible prescriptions and chiled dose calculation

Continuous Assessment Pattern			
Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	PHARMACEUTICAL CHEMISTRY-II Practical			
Course Code	DPHT2052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

List of Experiments:

- Solubility determination of Paracetamol
- Solubility determination of Aspirin
- Melting point determination of hippuric acid
- Melting point determination of Metronidazole
- Boiling point determination of organic compound
- Detection of elements
- Functional groups determination

- To detect the presence of functional groups in the given sample
- Identification tests of barbiturates
- Identification tests of sulfonamides,
- Identification tests of Phenothiazine's
- Identification tests of Antibiotics like Erythromycin, Tetracycline, Cephalexin etc.
- To prepare and submit aspirin from salicylic acid
- To prepare and submit picric acid from phenol.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	Pharmacology and Toxicology Practical			
Course Code	DPHT2053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

List of Experiments:

- Effect of K⁺, Ca⁺⁺, acetylcholine and adrenaline on frog's heart.
- Effect of Ca⁺⁺ on frog's heart.

Effect of adrenaline on frog's heart.

Effect of acetylcholine on frog's heart.

Effect of acetylcholine on rectus abdominis muscle of Frog and guinea pig ileum.

Effect on spasmogens and relaxants on rabbits intestine

Effect of local anaesthetics on rabbit cornea.

Effect of miotics on rabbits eye.

Effect of mydriatics on rabbits eye.

To study the action of strychnine on frog.

	0	0	2	1
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Effect of digitalis on frog's heart.

Effect of hypnotics in mice.

Effect of convulsants and anticonvulsant in mice or rats.

Test for pyrogen.

Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.

Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

List of Experiments:

1. Categorization and storage of Pharmaceutical products based on legal requirements of labeling and storage
2. Project report on visit to the nearby Community for Counseling on the rational use of drugs and aspects of health care.
3. Prescription handling and identification of drug interactions, incompatibilities.
4. "Health screening services and study of equipments for:-Blood glucose determination (Glucometer Health screening services and study of equipments for Blood pressure (BP apparatus)
5. Health screening services and study of equipments for Lung function test (Peak flow meter)
6. Design of community pharmacy to incorporate all pharmaceutical care services (as per schedule N).
7. Study of OTC medications List & Available brands
8. Interpretation of various pathological report of blood.
9. Interpretation of various pathological report of urine.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

Name of The Course	Hospital and Clinical Pharmacy Practical			
Course Code	DPHT2054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C

Name of The Course	Medical Sales Representative			
Course Code	DPHT2055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

List of Experiments:

1. Deliver presentations to doctors, pharmacists and other potential customers.
2. Introduction to develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector.
3. Organizing medical conferences and promotional events.
4. Core skill professional skills related to organizing medical conferences and promotional events
5. Introduction to MCI Code of Conduct guidelines for MSR and UCP-MP Act.
6. Introduction to analyse the reports and deliver presentations.
7. Introduction to Organization Structure, Benefits and typical sales function in a Life Sciences organization.
8. Role of various stakeholders involved like CFA, Distributor, Stockist, and Liasoning Agent.
9. Introduction to products and selling and promotional activities.
10. Introduction to various systems of the Human body in tandem with physiology of that organ and system.

11. Introduction to scientific data presentations and briefings.
12. Introduction to hospitals, pharmacies and dealers.
13. Introduction to Therapeutics drug classes and catagories.
14. Role of various stakeholders involved like CFA, Distributor, Stockist, and Liasoning Agents.
Introduction to scientific data presentations and briefings.

Continuous

Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
0	20	80	100

COURSE BOOK - 2020

Volume-xx



**Curriculum and syllabus
2020-2021**

**School of Medical and Allied Sciences
Program: Bachelor of Pharmacy**

Department of Pharmacy

Bachelor of Pharmacy (B.Pharm)

Vision: To be recognized globally as a premier school in the field of Pharmaceutical Sciences for imparting value based education, and engaged in multidisciplinary and collaborative research.

Mission:

M1: Establish state-of-the-art facilities to analyze develop test and invent new methods in Pharmaceutical Science by involving multiple stakeholders

M2: Establishing Center of Excellences for multidisciplinary collaborative research by involving industries and academia.

M3: To train the students and faculties into analytical approach and developing new products specially in Natural and Herbal pharmaceutical Products

Program Educational Objectives:

- **Contribute as futuristic healthcare professionals and promote research in the field of Pharmacy profession.**
- **Undertake higher education, research or academia at institutions of transnational reputation and to involve in National Health Programs.**
- **Engage in ethical, progressive and contemporary contribution to the society by way of startups/ entrepreneurship.**

Program Specific Objectives

- **Have good command over ICT skills**
- **Develop Natural and Herbal pharmaceutical Products**

Program Outcomes

PO1	Pharmacy Knowledge	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; Pharmaceutical sciences; behavioral, social, and administrative issues of Pharmacy sciences.
PO2	Analytical Skill:	Graduates should be efficient in scrutinizing and identifying any deviations from basic theories learned
PO3	Application mode	Graduates should be able to handle independently any difficult situations in all related fields of Pharmaceutical Sciences and shall able to modify therapeutic applications without diminishing core values.
PO4	Planning Abilities	Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
PO5	Problem analysis	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions. Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO6	Problem analysis	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
PO7	Leadership skills	Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
PO8	Professional Identity	Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
PO9	Pharmaceutical Ethics	Honor personal values Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the

		decisions.
PO10	Communication	Communicate effectively with the community and with society, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
PO11	The Pharmacist and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
PO12	Environment and sustainability	Understand the impact of the professional pharmacy solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
PO13	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Curriculum

			Semester 1							
Sl. No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1	BPHT1001	Human Anatomy and Physiology I – Theory	3	1		4	10	15	75	100
2	BPHT1002	Pharmaceutical Analysis I – Theory	3	1		4	10	15	75	100
3	BPHT1003	Pharmaceutics I – Theory	3	1		4	10	15	75	100
4	BPHT1004	Pharmaceutical Inorganic Chemistry – Theory	3	1		4	10	15	75	100
5	BPHT1005	Communication skills – Theory *	2	-		2	5	10	35	50
6	BPHT1006 BPHM1006	Remedial Biology/ Remedial Mathematics – Theory*	2	-		2	5	10	35	50
7	BPHP1007	Human Anatomy and Physiology – Practical		-	4	2	5	10	35	50
8	BPHP1008	Pharmaceutical Analysis I – Practical		-	4	2	5	10	35	50
9	BPHP1009	Pharmaceutics I – Practical		-	4	2	5	10	35	50
10	BPHP1010	Pharmaceutical Inorganic Chemistry – Practical		-	4	2	5	10	35	50
11	BPHP1011	Communication skills – Practical*			2	1	5	5	15	25
12	BPHR1012	Remedial Biology – Practical			2	1	5	5	15	25
		Total	16	4	20	30	80	130	540	750

Semester II										
Sl No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1	BPHT2001	Human Anatomy and Physiology II – Theory	3	1		4	10	15	75	100
2	BPHT2002	Pharmaceutical Organic Chemistry I – Theory	3	1		4	10	15	75	100
3	BPHT2003	Biochemistry – Theory	3	1		4	10	15	75	100
4	BPHT2004	Pathophysiology – Theory	3	1		4	10	15	75	100
5	BPHT2005	Computer Applications in Pharmacy – Theory *	3			3	10	15	50	75
6	BPHT2006	Environmental sciences – Theory *	3			3	10	15	50	75
7	BPHP2007	Human Anatomy and Physiology II – Practical			4	2	5	10	35	50
8	BPHP2008	Pharmaceutical Organic Chemistry I – Practical			4	2	5	10	35	50
9	BPHP2009	Biochemistry – Practical			4	2	5	10	35	50
10	BPHP2010	Computer Applications in Pharmacy – Practical*	2			1	5	5	15	25
		Total	18	4	12	29	80	125	520	725
Semester III										
Sl No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1	BPHT3001	Pharmaceutical Organic Chemistry II – Theory	3	1		4	10	15	75	100
2	BPHT3002	Physical	3	1		4	10	15	75	100

		Pharmaceutics I – Theory								
3	BPHT3003	Pharmaceutical Microbiology – Theory	3	1		4	10	15	75	100
4	BPHT3004	Pharmaceutical Engineering – Theory	3	1		4	10	15	75	100
5	UHVE1001	Universal Human Values and Ethics			2	2	10	15	75	100
6	BPHP3005	Pharmaceutical Organic Chemistry II – Practical			4	2	5	10	35	50
7	BPHP3006	Physical Pharmaceutics I – Practical			4	2	5	10	35	50
8	BPHP3007	Pharmaceutical Microbiology – Practical			4	2	5	10	35	50
9	BPHP3008	Pharmaceutical Engineering – Practical			4	2	5	10	35	50
		Total	12	4	18	26	70	115	515	700
			Semester IV							
SI No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1	BPHT4001	Pharmaceutical Organic Chemistry III– Theory	3	1		4	10	15	75	100
2	BPHT4002	Medicinal Chemistry I – Theory	3	1		4	10	15	75	100
3	BPHT4003	Physical Pharmaceutics II – Theory	3	1		4	10	15	75	100
4	BPHT4004	Pharmacology I – Theory	3	1		4	10	15	75	100
5	BPHT4005	Pharmacognosy and Phytochemistry I– Theory	3	1		4	10	15	75	100
6	BPHP4006	Medicinal Chemistry I –			4	2	5	10	35	50

		Lab								
7	BPHP4007	Physical Pharmaceutics II – Lab			4	2	5	10	35	50
8	BPHP4008	Pharmacology I – Lab			4	2	5	10	35	50
9	BPHP4009	Pharmacognosy and Phytochemistry I – Lab			4	2	5	10	35	50
		Total	15	5	16	28	70	115	515	700
Semester V										
Sl No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1	BPHT5001	Medicinal Chemistry II – Theory	3	1		4	10	15	75	100
2	BPHT5002	Industrial Pharmacy I– Theory	3	1		4	10	15	75	100
3	BPHT5003	Pharmacology II – Theory	3	1		4	10	15	75	100
4	BPHT5004	Pharmacognosy and Phytochemistry II– Theory	3	1		4	10	15	75	100
5	BPHT5005	Pharmaceutical Jurisprudence – Theory	3	1		4	10	15	75	100
6	BPHP5006	Industrial Pharmacy I – Lab			4	2	5	10	35	50
7	BPHP5007	Pharmacology II – Lab			4	2	5	10	35	50
8	BPHP5008	Pharmacognosy and Phytochemistry II – Lab			4	2	5	10	35	50
		Total	15	5	12	26	65	105	480	650
Semester VI										
Sl No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1.	BPHT6001	Medicinal Chemistry III –	3	1		4	10	15	75	100

		Theory								
2.	BPHT6002	Pharmacology III – Theory	3	1		4	10	15	75	100
3.	BPHT6003	Herbal Drug Technology – Theory	3	1		4	10	15	75	100
4.	BPHT6004	Biopharmaceutics and Pharmacokinetics – Theory	3	1		4	10	15	75	100
5.	BPHT6005	Pharmaceutical Biotechnology – Theory	3	1		4	10	15	75	100
6.	BPHT6006	Quality Assurance – Theory	3	1		4	10	15	75	100
7	BPHP6007	Medicinal chemistry III – Lab			4	2	5	10	35	50
8.	BPHP6008	Pharmacology III – Lab			4	2	5	10	35	50
9	BPHP6009	Herbal Drug Technology- Lab			4	2	5	10	35	50
		TOTAL	18	6	12	30	75	120	555	750
Semester VII										
Sl No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
1	BPHT7001	Instrumental Methods of Analysis – Theory	3	1		4	10	15	75	100
2	BPHT7002	Industrial Pharmacy II – Theory	3	1		4	10	15	75	100
3	BPHT7003	Pharmacy Practice – Theory	3	1		4	10	15	75	100
4	BPHT7004	Novel Drug Delivery System – Theory	3	1		4	10	15	75	100
5	BPHP7005	Instrumental Methods of Analysis – Practical			4	2	5	10	35	50
6	BPPS7006	Practice School				6	10	15	100	125
		Total	12	4	4	24	55	85	435	575

			Semester VIII							
SI No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	Sessional exam	ETE	Total
	BPHT8001	Biostatistics and Research Methodology	3	1		4	10	15	75	100
2	BPHT8002	Social and Preventive Pharmacy	3	1		4	10	15	75	100
3	BPPW8012	Project Work			12	6			150	150
		Total	6	2	12	14	20	30	300	350

List of Electives

Elective-1(Semester VII)

SI No	Course Code	Name of the Electives					Assessment Pattern			
			L	T	P	C	Sessional Exam	ETE	Total	
1	BPMR7007	Medical sales representative	3	0		3	25	75	100	
2	BPPM7008	Production and manufacturing								
3	BPQA7009	Quality assurance								
4	BPQC7010	Quality control								
5	BPMR7011	Medical sales representative-I Practical				4	2	15	35	50
6	BPPM7012	Production and manufacturing-I Practical								
7	BPQA7013	Quality assurance-I Practical								
8	BPQC7014	Quality control-I Practical								
		Total	6	0	2	7	40	110	150	

Elective-2 (Semester VIII)

SI No	Course Code	Name of the Elective					Assessment Pattern			Total
			L	T	P	C	IA	Sessional exam	ETE	
1	BPET8003	Pharma Marketing Management	3+3 =6	2		8	20	30	150	200
2	BPET8004	Pharmaceutical Regulatory Science								
3	BPET8005	Pharmacovigilance								
4	BPET8006	Quality Control and								

		Standardization of Herbals.								
5	BPET8007	Computer Aided Drug Design								
6	BPET8008	Cell and Molecular Biology								
7	BPET8009	Cosmetic Science								
8	BPET8010	Experimental Pharmacology								
9	BPET8011	Advanced Instrumentation Techniques								
10	BPET8012	Dietary Supplements and Nutraceuticals								
11	BPET8013	Pharmaceutical product development								
12	BPMP8014	Medical Sales Representative-II	3	0		3		25	75	100
13	BPPM8015	Production and Manufacturing-II								
14	BPQA8016	Quality Assurance-II								
15	BPQC8017	Quality Control-II								
16	BPMP8018	Medical Sales Representative-II Lab			4	2		15	35	50
17	BPPM8019	Production and manufacturing- II Lab								
18	BPQA8020	Quality Assurance-II Lab								
19	BPQC8021	Quality Control- II Lab								
		Total	9	2	4	13	20	70	260	350

Detailed Syllabus

Name of The Course	Human Anatomy and Physiology-I			
Course Code	BPHT1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system.

Course Outcomes

CO1	Student will able to understand the Cell and Tissues.
CO2	Students will able to analyze about Integumentary system, Skeletal system and Joints.
CO3	Student will able to analyze Body fluids and blood and Lymphatic system.
CO4	Student will able to analyze about Peripheral nervous system and Special senses.
CO5	Student will able to analyze the Cardiovascular system.
CO6	Student will able to develop relevance and need of recent trends in particular organ system.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I:	Introduction
Unit I:	Introduction
10 hours	
<ul style="list-style-type: none"> • Introduction to human body Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology. • Cellular level of organization Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine • Tissue level of organization Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues. 	
Unit II:	10 Hours
<ul style="list-style-type: none"> • Integumentary system Structure and functions of skin • Skeletal system Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction • Joints 	

Structural and functional classification, types of joints movements and its articulation	
Unit III:	10
Hours	
Body fluids and blood: Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.	
Lymphatic system: Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system	
Unit	IV:
8 Hours	
<ul style="list-style-type: none"> • Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves. • Special senses Structure and functions of eye, ear, nose and tongue and their disorders. 	
Unit V:	
7 Hours	
Cardiovascular system Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.	
Unit	VI:
8 Hours	
Advances/Recent Trends in: cell signalling, cell communication, monitoring of Skeletal anatomy and physiology, blood transfusion, neurology, monitoring of special senses, cardiovascular imaging, cardiovascular function	

monitoring.

Suggested Reading

Text Books

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John.E.Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.

Reference Books

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee ,Academic Publishers Kolkata
4. Difore S.H. "Atlas of Normal Histology" – Lea & Febiger Philadelphia.

Name of The Course	PHARMACEUTICAL ANALYSIS-I			
Course Code	BPHT1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1.Understand the principles of volumetric and electro chemical analysis

2.Carryout various volumetric and electrochemical titrations

3. Develop analytical skills

Course Outcomes

CO1	The students shall be able to remember the different techniques of analysis, methods of expressing concentration, primary and secondary standards, Sources of impurities in medicinal agents and limit tests.
CO2	The students shall be able to understand the basic principle of acid base titration and Non-aqueous titration.
CO3	The students shall be able to apply the basic principle of Precipitation titrations, Complexometric titration and Gravimetry.
CO4	The students shall be able to analyze the basic principle of Redox titrations.
CO5	The students shall be able to evaluate the basic principle of electrochemical methods of analysis.
CO6	The students shall be able to analyze Advancement in chromatography and Kinetic method of analysis

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

<p>Unit I: Pharmaceutical analysis and errors 10 Hours</p> <p>(a) Pharmaceutical analysis- Definition and scope i) Different techniques of analysis ii) Methods of expressing concentration iii) Primary and secondary standards. iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate</p> <p>(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and</p>

significant figures
(c) Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

Unit II: Acid base titration and Non-aqueous titration **10 Hours**

- Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
- Non-aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

Unit III: Precipitation titrations, Complexometric titration and Gravimetry **10 Hours**

- Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
- Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
- Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
- Basic Principles, methods and application of diazotisation titration.

Unit IV: Redox titrations

08 Hours

- (a) Concepts of oxidation and reduction
(b) Types of redox titrations (Principles and applications)
Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

Unit V: Electrochemical methods of analysis **07 Hours**

- Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.
- Potentiometry - Electrochemical cell,

construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.

- Polarography - Principle, Ilkovic equation, construction and working of dropping mercury

Unit VI Chromatography and Kinetic method of analysis. 08 Hours

Advancement in chromatography-Supercritical fluid chromatography, Hydrophilic interaction chromatography, LCMS, Analysis of protein biopharmaceuticals and conjugates. Process analytical technology, Kinetic method of analysis.

Suggested Reading

1. Mendham J, Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., "Vogel's Textbook of Quantitative Chemical Analysis", Pearson Education Asia.
2. Conners K.A., "A Text book of Pharmaceutical Analysis", Wiley Inter-science.
3. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
4. Alexeyev V. "Quantitative Analysis". CBS Publishers & Distributors.
5. Valentina D Atri, Szabolcs Fekete, Adrian Clarke, Jean-Luc Veuthey, and Davy Guillaume. Recent advances in chromatography for pharmaceutical analysis. Analytical Chemistry. 2018
6. Marin, G.B., Yablonsky, G.S. and Constales, D., 2019. Kinetics of chemical reactions: Decoding complexity. John Wiley & Sons.

Name of The Course	Pharmaceutics I – Theory			
Course Code	BPHT1003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of this course the student should be able to:

1. Know the history of profession of pharmacy
2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
3. Understand the professional way of handling the prescription
4. Preparation of various conventional dosage forms

Course Outcomes

CO1	Recall History of Pharmacy, Pharmacopoeia, prescription and posology.
CO2	Demonstrate the powder dosage form, pharmaceutical calculation and liquid dosage form.
CO3	Identify various types of liquid dosage form.
CO4	Analyze the importance of Suppository and categorize the pharmaceutical incompatibilities.
CO5	Evaluate the various types of semisolid dosage form.
CO6	Elaborate the advances in in pharmaceutical dosage forms.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

- **Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- **Dosage forms:** Introduction to dosage forms, classification and definitions

- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

Unit II: 10 Hours

- **Pharmaceutical calculations:** Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
- **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

Unit III: 8 Hours

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- **Biphasic liquids:**
- **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.
- **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

Unit IV: 8 Hours

- **Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- **Pharmaceutical incompatibilities:** Definition,

classification, physical, chemical and therapeutic incompatibilities with examples.

Unit V: 7 Hours

- **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms

Unit VI: 8 Hours

Advancement in Pharmaceutical Formulation Development

- FDA requirement for Investigational New Drug Application.
- ICH guidelines for the stability studies of pharmaceutical products.
- Role of GMP in pharmaceutical preparation
- Introduction, advantages and limitations of novel drug delivery system.
- Introduction and advantages of parenteral drug delivery system.

Suggested Reading

Text Books

1. Carter S.J., “Cooper and Gunn’s Tutorial Pharmacy”, CBS Publishers, Delhi.
2. Rawlins E.A., “Bentley’s Text Book of Pharmaceutics”, ELBS Bailliere Tyndall.
3. Lachman L, Liberman H.A and Kanig J.L., “Theory and Practice of Industrial Pharmacy”, Lea and Febiger.
4. Cooper and Gunn’s Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.
5. Aulton, M.E, Text Book of Pharmaceutics, Vol. I & II. Churchill Livingstone

Reference Books

1. United States Pharmacopoeia (National Formulary).
2. Remington – “The science and practice of pharmacy” Vol. I & II. Mack Publishing Co., Pennsylvania.

3. Pharmacopoeia of India, The Controller of Publications, Delhi.

4. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge

Other References

1. Bandawane, A. and Saudagar, R., 2019. A Review on Novel Drug Delivery System: A Recent Trend. Journal of Drug Delivery and Therapeutics, 9(3), pp.517-521.

2. Pagar, K.R. and Khandbahale, S.V., 2019. A Review on Novel Drug Delivery System: A Recent Trend. Asian Journal of Pharmacy and Technology, 9(2), pp.135-140.

3. Reyhaneh Azarmi and Ali Ashjarian. Type and application of some common surfactants. Journal of Chemical and Pharmaceutical Research, 2015, 7(2):632-640.

4. <http://nanoparticles.org/pdf/Salager-E300A.pdf>

5. Sunil Kumar. The Importance Of Antioxidant And Their Role In Pharmaceutical Science - A Review. Asian Journal of Research in Chemistry and Pharmaceutical Sciences. 1(1), 2014, 27 - 44.

6. <https://www.intechopen.com/books/antioxidants/antioxidant-compounds-and-their-antioxidant-mechanism>

7. http://shodhganga.inflibnet.ac.in/bitstream/10603/37740/6/06_chapter1.pdf

8. Chandra, A., Sharma, U., Jain, S.K. and Soni, R.K., 2013. Nanosuspension: an overview. Journal of Drug Delivery and Therapeutics, 3(6), pp.162-167.

9. Patel, R.P. and Joshi, J.R., 2012. An overview on nanoemulsion: a novel approach. International Journal of Pharmaceutical Sciences and Research, 3(12), p.4640.

Name of The Course	PHARMACEUTICAL INORGANIC CHEMISTRY			
Course Code	BPHT1004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C

	3	1	0	4
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Course Objectives

Upon completion of course student shall be able to

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. Understand the medicinal and pharmaceutical importance of inorganic compounds

Course Outcomes

CO1	Remember the contents and role of pharmacopoeia in pharmaceutical Science.
CO2	Understand the role of electrolyte in biological fluids and human body.
CO3	Apply the knowledge of Inorganic compounds in gastrointestinal disorders.
CO4	Analyse the use of inorganic compound in pharmaceutical preparations
CO5	Assess the role of radioactive compounds in pharmaceuticals
CO6	Creating the concept for application of inorganic compound in pharmaceuticals

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit-1 Introduction	10 hours
Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate . General methods of preparation, assay for the compounds superscripted with asterisk (*), properties and medicinal uses of inorganic compounds belonging to the following classes.	
Unit II: Hours	8
Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical	

<p>systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.</p> <p>Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.</p> <p>Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.</p>
<p>Unit III: 10 Hours</p>
<p>Gastrointestinal agents</p> <p>Acidifiers: Ammonium chloride* and Dil. HCl</p> <p>Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture</p> <p>Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite</p> <p>Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations</p>
<p>Unit-IV 08 Hours</p>
<p>Miscellaneous compounds</p> <p>Expectorants: Potassium iodide, Ammonium chloride*.</p> <p>Emetics: Copper sulphate*, Sodium potassium tartarate</p> <p>Haematinics: Ferrous sulphate*, Ferrous gluconate</p> <p>Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite³³³</p> <p>Astringents: Zinc Sulphate, Potash Alum</p>
<p>Unit-V 07 Hours</p>
<p>Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & pharmaceutical application of radioactive substances.</p>

<p>Unit IV 08 Hours</p>
<p>Recent Advances in Pharmaceutical Inorganic chemistry</p> <ul style="list-style-type: none"> • Water for injection. • Radiopharmaceuticals used for drug discovery and development. • Inorganic compounds used in pharmaceutical preparations. • Metallic compounds used in pharmaceutical preparations.

Suggested Reading

Text Book (s)

Text Book (s)

1. A.I. Vogel, Text Book of Quantitative Inorganic analysis
2. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
3. M.L Schroff, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. Anand & Chatwal, Inorganic Pharmaceutical Chemistry

Reference Book

1. Atherden L.M., Bentley and Drivers' "Text Book of Pharmaceutical Chemistry", Oxford University Press, London..
2. Indian Pharmacopoeia
 1. <https://www.drugs.com/pro/water-for-injection.html>
 2. WHO Guidelines. Production of water for injection by means other than distillation. https://www.who.int/medicines/areas/quality_safety/quality_assurance/QAS19_786_Rev_1_Water_for_Injection.pdf?ua=1
3. Radiopharmaceuticals: Drug Development and Regulatory Issues. https://link.springer.com/chapter/10.1007/978-3-540-76735-0_20
4. Radioactive Drugs in Clinical Medicine. <https://www.iaea.org/sites/default/files/15205681319>.

pdf

5. https://www.researchgate.net/publication/267961271_Metal_Based_Drugs_Current_Use_and_Future_Potential

Introduction to pharmaceutical inorganic chemistry. 6. http://www.bspublications.net/downloads/059c4987a9551e_Ch1_Pharmaceutical%20Inorganic%20Chemistry_2nd%20Ed._Algarsamy.pdf

7. Medicinal Uses of Inorganic Compounds - 1. <https://www.ias.ac.in/article/fulltext/reso/011/04/0075-0090>.

Name of The Course	COMMUNICATION SKILLS (Theory) 30 hrs.			
Course Code	BPHT1005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Course Outcomes

CO1	Student will be able to develop effective communication skills for professionals.
CO2	Students will be able to develop interview handling skills.
CO3	Students will be able to develop presentation skills.
CO4	Students will be able to develop the skills for meeting people and asking questions
CO5	Students will be develop the listening skills and and effective written communication.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test	Total Marks

		(ETE)	
10	15	75	100

Unit-1 Introduction

10 hours

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

Unit-2

10 Hours

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

Communication Styles: Introduction, The Communication Styles Matrix with example for each - Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

Unit-3

08

Hours

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

Unit-4 07 Hours

Interview Skills: Purpose of an interview, Do's and Don't

Giving Presentations: Dealing with Fears, Planning your Presentation, Delivering Your Presentation, Techniques of Delivery	Anti-Prerequisite, Structuring Your Delivery			
	L	T	P	C
Unit-5	2	0	0	2
Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion				

Course Objectives:

Upon completion of the course, the student shall be able to

1. know the classification and salient features of five kingdoms of life
2. understand the basic components of anatomy & physiology of plant
3. know understand the basic components of anatomy & physiology animal with special reference to human

Course Outcomes

The student shall be able to

CO1	Analyze basic classification of five kingdoms of life and morphology of flowering plants
CO2	Analyze components of body fluids, mechanism of breathing and respiration and role of digestive enzymes in digestion and absorption
CO3	Apply the anatomy & physiology animal with special reference to human excretory system ,reproduction system,Endocrine glands.
CO4	Analyze/familiarize with plants and mineral nutrition and factors affecting photosynthesis.
CO5	Analyze the plant growth & structure, functions of cell and tissue.
CO6	Elaborate the skeletal system and joint with disorders.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

Unit I: Living world and Morphology of Flowering

Text Book (s)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010

Reference Book (s)

1. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
2. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
3. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
4. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
5. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
6. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

Name of The Course	REMEDIAL BIOLOGY (Theory) 30 hrs.
Course Code	BPRT 1006
Prerequisite	
Corequisite	

<p>plants</p> <p style="text-align: right;">7 Hours</p>	<p>Generation and conduction of nerve impulse Structure of brain and spinal cord Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata</p> <p>Chemical coordination and regulation : Endocrine glands and their secretions Functions of hormones secreted by endocrine glands</p> <p>Human reproduction : Parts of female reproductive system Parts of male reproductive system Spermatogenesis and Oogenesis Menstrual cycle</p> <p>Unit IV: Plants and mineral nutrition 5 Hours</p>
<p>Living world: Definition and characters of living organisms Diversity in the living world Binomial nomenclature Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus.</p> <p>Morphology of Flowering plants : Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones.</p>	<p>Plants and mineral nutrition:</p> <p>Essential mineral, macro and micronutrients</p> <p>Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation</p> <p>Photosynthesis</p> <p>Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.</p>
<p>Unit II: Body fluids and circulation</p> <p>7 Hours</p>	<p>Unit V: Plant respiration 4 Hours</p>
<p>Composition of blood, blood groups, coagulation of blood :</p> <p>Composition and functions of lymph</p> <p>Human circulatory system Structure of human heart and blood vessels Cardiac cycle, cardiac output and ECG</p> <p>Digestion and Absorption Human alimentary canal and digestive glands Role of digestive enzymes Digestion, absorption and assimilation of digested food</p> <p>Breathing and respiration Human respiratory system Mechanism of breathing and its regulation Exchange of gases, transport of gases and regulation of respiration Respiratory volumes</p>	<p>Plant respiration: Respiration, glycolysis, fermentation (anaerobic). Plant growth and development Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators</p> <p>Cell - The MODULE of life Structure and functions of cell and cell organelles. Cell division</p> <p>Tissues Definition, types of tissues, location and functions.</p>
<p>Unit III: Excretory products and their elimination</p> <p style="text-align: right;">7 Hours</p>	<p>Unit VI: Skeletal System 8 Hours</p>
<p>Excretory products and their elimination : Modes of excretion Human excretory system- structure and function Urine formation Rennin angiotensin system</p> <p>Neural control and coordination : Definition and classification of nervous system Structure of a neuron</p>	<p>Skeletal System: Structure and Functions of skeletal system, classification: Axial skeletal : cranium bones, facial bones, ribs, vertebral column, Hyoid bones and ear</p>

bones, Appendicular bones: upper limbs, lower limbs, pectoral and pelvic girdle.

Joints & joint disorder:

Definition, types of joints: Fibrous, cartilagenous and synovial joints, joint disorder.

Suggested Reading

Text Books

1. Text book of Biology by S. B. Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.
3. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate.
4. Garg K, Joshi M, Kundu S. Anatomy & Physiology. CBS Publishers & Distributors.
5. Murugesh N. Basic Anatomy And Physiology. Sathya Publisher.

Reference Books

1. A Text book of Biology by B.V. Sreenivasa Naidu
2. A Text book of Biology by Naidu and Murthy
3. Botany for Degree students By A.C.Dutta
4. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan.

Name of The Course	REMEDIAL MATHEMATICS (Theory) 30 hrs.			
Course Code	BPMT 1006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the course the student shall be able to:-

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

Course Outcomes

CO1	The students will be able to use the statistical tools for pharmacy applications.
CO2	The students will be able to design the experiments and perform ANOVA analysis of the results.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Unit-1

Introduction

06 hours

Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

Function:

Real Valued function, Classification of real valued functions,

Limits and continuity :

Introduction, Limit of a function, Definition of limit of a function

Unit-2

06 Hours

Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation

and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations

Unit-3

06 Hours

Calculus

Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of x^n w.r.t. x , where n is any rational number, Derivative of e^x , Derivative of $\log_e x$, Derivative of a^x , Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

Unit-4 06 Hours

Analytical Geometry

Introduction: Signs of the Coordinates, Distance formula, Straight Line : Slope or gradient of a straight line, Perpendicularity of two lines, Slope of a line joining two points, Slope, intercept and form of a straight line

Integration:

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

Unit-5 06 Hours

Differential Equations : Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations

Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations

Text Book (s)

1. Differential Calculus by Shanthinarayan

2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.

Reference Book (s)

1. Integral Calculus by Shanthinarayan
2. Higher Engineering Mathematics by Dr.B.S.Grewal

Name of The Course	HUMAN ANATOMY AND PHYSIOLOGY (Practical) -4 hrs/week			
Course Code	BPHP1007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

To understand the anatomy and physiology, concepts of health and disease of human body

Course Outcomes

CO1 Students will able to analyze functional conditions for parallelism and tissues, skeletal system, skeletal and smooth muscles.

CO2 Students will able to perform experiments of compositions, functions of blood and its elements.

Text Book (s)

- 1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
- 2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Book (s)

- 1. Physiological basis of Medical Practice- Best and Tailor. Williams & Wilkins Co, Riverview, MI USA

- 2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
- 3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

Course Content

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. To study the integumentary and special senses using specimen, models, etc.,
7. To study the nervous system using specimen, models, etc.,
8. To study the endocrine system using specimen, models, etc
9. To demonstrate the general neurological examination
10. To demonstrate the function of olfactory nerve
11. To examine the different types of taste.
12. To demonstrate the visual acuity
13. To demonstrate the reflex activity
14. Recording of body temperature
15. To demonstrate positive and negative feedback mechanism.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	PHARMACEUTICAL ANALYSIS –I (Practical)
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Course Code	BPHP1008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

The basic objective of this course is to get familiar with titrations and analysis.

Course Outcomes

CO1	The student will be able to illustrate the limit test for identification and control of small amount impurity.
CO2	The student will be able to illustrate the preparation and standardization of different concentrations solutions.
CO3	The student will be able to illustrate the assay of the compounds along with standardization of Titrant.
CO4	The student will be able to illustrate the determination of normality by electro-analytical methods.

Text Book (s)

1. Mendhanm J, Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., "Vogel's Textbook of Quantitative Chemical Analysis", Pearson Education Asia.
2. Connors K.A., "A Text book of Pharmaceutical Analysis", Wiley Inter-science.
3. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London

Reference Book (s)

1. British Pharmacopocia, Her Majesty's Stationary Office, University Press, Cambridge.
2. Alexeyev V. "Quantitative Analysis". CBS Publishers & Distributors
6. The Pharmacopoeia of India.

Course Content

Limit Test of the following

(1) Chloride (2) Sulphate (3) Iron (4) Arsenic
Preparation and standardization of (1) Sodium hydroxide (2) Sulphuric acid (3) Sodium thiosulfate (4) Potassium permanganate (5) Ceric ammonium sulphate
Assay of the following compounds along with Standardization of Titrant (1) Ammonium chloride by acid base titration (2) Ferrous sulphate by Cerimetry (3) Copper sulphate by Iodometry (4) Calcium gluconate by complexometry (5) Hydrogen peroxide by Permanganometry (6) Sodium benzoate by non-aqueous titration (7) Sodium Chloride by precipitation titration
<ul style="list-style-type: none"> Determination of Normality by electro-analytical methods (1) Conductometric titration of strong acid against strong base (2) Conductometric titration of strong acid and weak acid against strong base (3) Potentiometric titration of strong acid against strong base

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks	
5	10	35	50	
Name of The Course	PHARMACEUTICS-I (Practical)			
Course Code	BPHP1009			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Upon completion of this course the student should be able to:

1. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
2. Understand the professional way of handling the prescription
3. Preparation of various conventional dosage forms

Course Outcomes

CO1	Students will be able to formulate liquid dosage form.
CO2	Students will be able to formulate solution.
CO3	Students will be able to formulate semi-solid dosage form.

Text Book (s)

1. Carter S.J., "Cooper and Gunn's Tutorial Pharmaceutical Methods" CBS Publishers, Delhi.
2. Rawlins E.A., "Bentley's Text Book of Pharmaceutical Chemistry" ELBS Bailliere Tynndall.
3. Lachman L, Liberman H.A and Kanig J.L., "Theory and Practice of Industrial Pharmacy", Lea and Febiger.
4. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.

Reference Books

1. Aulton, M.E, Text Book of Pharmaceutics, Vol., I & II. Churchill Livingstone.
2. United States Pharmacopoeia (National Formulary).
3. Remington – "The science and practice of pharmacy" Vol. I & II. Mack Publishing Co., Pennsylvania.
4. Pharmacopoeia of India, The Controller of Publications, Delhi.
5. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.

1. Syrups

- a) Syrup IP

b) Paracetamol pediatric syrup
2. Elixirs a) Piperazine citrate elixir b) Paracetamol pediatric elixir
3. Linctus Simple Linctus BPC
4. Solutions a) Strong solution of ammonium acetate b) Cresol with soap solution
5. Suspensions a) Calamine lotion b) Magnesium Hydroxide mixture
5. Emulsions a) Turpentine Liniment b) Liquid paraffin emulsion
6. Powders and Granules a) ORS powder (WHO) b) Effervescent granules c) Dusting powder
7. Suppositories a) Glycero gelatin suppository b) Soap glycerin suppository
8. Semisolids a) Sulphur ointment b) Non staining iodine ointment with methyl salicylate c) Bentonite gel
9. Gargles and Mouthwashes a) Potassium chlorate gargle b) Chlorhexidine mouthwash

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)
Course Code	BPHP 1010
Prerequisite	
Corequisite	

Antirequisite					
	L	T	P	C	
	0	0	4	2	

Course Objectives:

Physical & Chemical properties of inhalants, topical agents and imparts knowledge of inorganic compounds employed as Pharmaceuticals.

Course Outcomes

CO1	The student will be able to perform the Limit tests for ions.
CO2	The student will be able to perform the Identification tests for the inorganic compounds.
CO3	The student will be able to prepare the inorganic pharmaceutical compounds.

Text Book (s)

- Block, J.H. Roche, E, Soine, T and Wilson, C., "Inorganic, Medicinal & Pharmaceutical Chemistry", Lea & Febiger.
- Discher, C. A., et.al Modern Inorganic Pharmaceutical Chemistry, wave land press.

Reference Books

- Pharmacopoeia of India, 1996 edition.
- Atherden L.M., Bentley and Drivers' "Text Book of Pharmaceutical Chemistry", Oxford University Press, London.

Course Content**List of Experiments****Limit tests for following ions**

- Limit test for Chlorides and Sulphates
- Modified limit test for Chlorides and Sulphates
- Limit test for Iron
- Limit test for Heavy metals
- Limit test for Lead
- Limit test for Arsenic

Identification test

- Magnesium hydroxide
- Ferrous sulphate
- Sodium bicarbonate
- Calcium gluconate
- Copper sulphate

Test for purity

- Swelling power of Bentonite

2. Neutralizing capacity of aluminum hydroxide gel
3. Determination of potassium iodate and iodine in potassium Iodide

Preparation of inorganic pharmaceuticals

1. Boric acid
2. Potash alum
3. Ferrous sulphate

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	COMMUNICATION SKILLS (Practical)			
Course Code	BPHP 1011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business

Course Outcomes

CO1	Understand the behavioral needs for a Pharmacist to function effectively in the areas of Pharmaceutical operation
CO2	Communicate effectively (Verbal and Non Verbal)
CO3	Effectively manage the team as a team player
CO4	Develop interview skills
CO5	Develop Leadership qualities and essentials

Text Book (s)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011

2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013

Reference Book (s)

1. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
2. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
3. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
4. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
5. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
6. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
7. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

Course Content

Thefollowing learning modules are to be conducted using wordsworth® English language lab software

Basic communication covering the following topics

Meeting People
Asking Questions
Making Friends
What did you do?
Do's and Dont's

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Advanced Learning

Listening Comprehension / Direct and Indirect Speech
Figures of Speech
Effective Communication

Writing Skills Effective Writing Interview Handling Skills E-Mail etiquette Presentation Skills

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	REMEDIAL BIOLOGY (Practical)
Course Code	BPRP 1012
Prerequisite	
Corequisite	
Antirequisite	
	L T P C
	0 0 2 1

Course Objectives:

Upon completion of the course, the student shall be able to

1. know the classification and salient features of five kingdoms of life
2. understand the basic components of anatomy & physiology of plant
3. know understand the basic components of anatomy & physiology animal with special reference to human

Course Outcomes

CO1	The student will be able to analyze basic components of anatomy & physiology of plant by using microscope ,section cutting techniques mounting and staining,slide preparation.
CO2	The student will be able to analyze classification and salient features of five kingdoms of life after microscopic study of cell ,stem, root, leaf & identification of tissues.
CO3	The student will be able to analyze basic components of anatomy & physiology animal

with special reference to human bones and blood test .

Text Book (s)

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.

Reference Book (s)

1. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi

Course Content

1. Introduction to experiments in biology
 - a) Study of Microscope
 - b) Section cutting techniques
 - c) Mounting and staining
 - d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf and its modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Human Anatomy and Physiology-II
Course Code	BPHT2001
Prerequisite	
Co-requisite	
Anti-requisite	
	L T P C
	3 1 0 4

Course Objectives

- To familiarize the students with different systems of body.

Course Outcomes

CO1	The student will be able to apply basic knowledge of the Nervous system and understand their functions to know the actions of the drug.
CO2	The student will be able to Illustrate and recognize the major organs and components of the Digestive system with their functions.
CO3	The student will be able to illustrate the major organs and components of the Respiratory and Urinary system.
CO4	The student will be able to Illustrate and understand the functions of the Endocrine system.
CO5	The student will be able to Illustrate and recognize the major organs of the Reproductive system and understand their functions.
CO6	Student will able to develop relevance and need of recent trends in particular organ system.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Nervous system	10 Hours
<p>Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.</p> <p>Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity).</p>	

Unit II: Digestive System	10 Hours
<p>Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.</p> <p>Energetics Formation and role of ATP, Creatinine Phosphate and BMR.</p>	
Unit III: Respiratory System	10 Hours
<p>Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration, Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.</p> <p>Urinary system Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.</p>	
Unit IV: Endocrine system	10 Hours
<p>Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.</p>	
Unit V: Reproductive system	9 Hours
<p>Reproductive system Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition</p> <p>Introduction to genetics Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.</p>	
Unit VI:	8 Hours
<p>Advances/Recent Trends in: Neurology, gastroenterology, respiratory system and diseases, nephrology, endocrinology, diabetology, sex</p>	

hormone treatment, treatment of infertility.

Suggested Reading

Text Books

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.

Reference Books

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata
4. Difore S.H. "Atlas of Normal Histology" – Lea & Febiger Philadelphia

Name of The Course	PHARMACEUTICAL ORGANIC CHEMISTRY –I			
Course Code	BPHT2002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. The student will be able to relate the basic concept of organic chemistry.
2. The student will be able to analyze the reaction Mechanism.
3. The student will be able to understand the uses of different organic compound.
4. The student will be able to understand the name reactions.Course Outcomes

Course Outcomes

CO1	The student will be able to relate the basic concept of chemistry and its nomenclature to understand the complex chemistry.
CO2	The student will be able to analyze the effect of bonds in the basic skeleton of chemical structure
CO3	The student will be able to apply the concept of substitution/elimination reactions in the conversion of alkyl halides to the different functional group
CO4	The student will be able to analyze the role of carbonyl group and related functional group in the synthesis of newer molecules
CO5	The student will be able to assess the importance of carboxylic acid based molecules in the chemistry
CO6	

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Classification, nomenclature and isomerism **10 Hours**

Classification of Organic Compounds
Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds)
Structural isomerisms in organic compounds

Unit II: Alkanes, Alkenes and Conjugated dienes **10 Hours**

SP³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins.
Stabilities of alkenes, SP² hybridization in alkenes
E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions.

Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

Unit III: Alkyl halides and alcohol 10

Hours

SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

• Alcohols- Qualitative tests, Structure and uses of Ethyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

Unit IV: Carbonyl compounds (Aldehydes and ketones) 08 Hours

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde

Unit V: Carboxylic acids, Aliphatic amines

07 Hours

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

• Aliphatic amines - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanalamine, Ethylenediamine, Amphetamine

Suggested Reading

1. Mann, F.G, & Saunders, B.C., Practical Organic Chemistry, ELBS/ Longman.

2. Vogel A.I., Textbook of Practical Organic Chemistry, ELBS/Longman.

3. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

4. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

5. Morrison, R.T., and Boyd R.N., Organic Chemistry, Prentice Hall of India Pvt. Ltd,

Name of The Course	Biochemistry			
Course Code	BPHT2003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objective

Upon completion of course student shell able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.

2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.

3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins

Course Outcomes

CO1	To understand and Identify different metabolic pathways involved in Carbohydrate.
CO2	To understand and Identify different metabolic pathways involved in lipid and aminoacids.
CO3	To understand the Nucleic acid metabolism and genetic information
CO4	To understand and analyse the role of biomolecules and bioenergetics
CO5	to understand about the regulation of enzyme function, metals and vitamins as coenzymes.

CO6	The students will be able to understand about recent development of biochemistry.
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Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Carbohydrate metabolism

10 Hours

Glycolysis – Pathway, energetics and significance
Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD)

Gluconeogenesis- Pathway and its significance
Hormonal regulation of blood glucose level and Diabetes mellitus

Biological oxidation

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation inhibitors ETC and oxidative phosphorylation/Uncouplers

Unit II:

10 Hours

Lipid metabolism

β -Oxidation of saturated fatty acid (Palmitic acid)
Formation and utilization of ketone bodies; ketoacidosis

De novo synthesis of fatty acids (Palmitic acid)
Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism,

alkeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

Unit III:

10 Hours

Nucleic acid metabolism and genetic information transfer

Biosynthesis of purine and pyrimidine nucleotides
Catabolism of purine nucleotides and Hyperuricemia and Gout disease

Organization of mammalian genome

Structure of DNA and RNA and their functions

DNA replication (semi conservative model)

Transcription or RNA synthesis

Genetic code, Translation or Protein synthesis and inhibitors

Unit IV : 8 Hours

Biomolecules

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

Unit V: 7 Hours

Enzymes

Introduction, properties, nomenclature and IUB classification of enzymes

Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes

Unit VI : 5 Hours

Recent development of biochemistry.

References: <https://www.tandfonline.com/doi/abs/10.1080/10826068.2011.613976>

<https://link.springer.com/article/10.1007/s12010-008-8243-y>

Name of The Course	Pathophysiology			
Course Code	BPHT2004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. Describe the etiology and pathogenesis of the selected disease states
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases

Course Outcomes

CO1	Analyze pathogenesis of cell injury, adaptation and basic mechanism involved in the process of inflammation and repair
CO2	To Analyze the signs and symptoms of the diseases.
CO3	Analyze the concept of pathophysiology of disease involved in human body system
CO4	Analyze the complications of the diseases related to joints and cancer
CO5	Analyze the mode of transmission, its vector, causes of different infectious diseases and Sexually transmitted diseases
CO6	Assess the recent advances in pathophysiology and wound healing

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Basic principles of Cell injury and Adaptation 10 Hours

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

Basic mechanism involved in the process of inflammation and repair:

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

Unit II: Cardiovascular System 8 Hours

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

Respiratory system: Asthma, Chronic obstructive airways diseases.

Renal system: Acute and chronic renal failure

Unit III: Haematological Diseases. 10 Hours

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia

Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones

Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

Gastrointestinal system: Peptic Ulcer

Unit IV: Disease of bones and joints 08 Hours

Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.

Disease of bones and joints: Rheumatoid arthritis,

osteoporosis and gout Principles of cancer: classification, etiology and pathogenesis of cancer
Unit V: Infectious diseases 07 Hours
Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections Sexually transmitted diseases: AIDS, Syphilis, Gonorrhoea
Unit VI: Recent Advances in Pathophysiology 08 Hours
Recent advances in understanding human malignancy, Advances in wound healing and wound care, Autophagy and regulated necrosis, Recent advances in the pathophysiology of inherited metabolic diseases.

Suggested Reading

1. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.

2. C Simon Herrington¹, Richard Poulson² and Philip J Coates, Recent Advances in Pathology: the 2019 Annual Review Issue of The Journal of Pathology, *J Pathol* 2019; 247: 535–538.

3. Patricia F. Schuck, Recent advances in the pathophysiology of inherited metabolic diseases, *Int J Dev Neurosci.* 2020;80:50–51.

4. Mariana Barreto Serra et al., From Inflammation to Current and Alternative Therapies Involved in Wound Healing, *International Journal of Inflammation* Volume 2017, Article ID 3406215, 17 pages.

5. Sujata Sarabahi. Recent advances in topical wound care, *Indian J Plast Surg.* 2012 May-Aug; 45(2): 379–387.

Name of The Course	COMPUTER APPLICATIONS IN PHARMACY (Theory) 30 hrs			
Course Code	BPHT 2005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

Upon completion of the course the student shall be able to

1. Know the various types of application of computers in pharmacy
2. Know the various types of databases
3. Know the various applications of databases in pharmacy

Course Outcomes Upon completion of this course the student should be able to:

CO1	know the various types of application of computers in pharmacy.
CO2	know the various types of databases
CO3	know the various applications of databases in pharmacy
CO4	To know the concept of bioinformatics related to pharmacy
CO5	Data analysis in preclinical development related to pharmacy.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	50	75

Course Content

Unit-1	06 Hours
Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division	
Concept of Information Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project	
Unit-2	06 Hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products
Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

Unit-3 06 Hours

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

Unit-4 06 Hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

Unit-5 06 Hours

Computers as data analysis in Preclinical development: Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)

Text Book (s)

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1-A, 11 Darya Gani, New Delhi – 110 002(INDIA)

Reference Book (s)

1. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Name of The Course	Environmental Sciences			
Course Code	BPHT 2004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3			3

Course Objectives

Upon completion of the course the student shall be able to:

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course Outcomes

CO1	The Environmental studies prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective.
CO2	Students will describe and analyze the current national and global environmental problems; looking at the science behind them, the economics involved, and the policies regarding them.
CO3	Appraise the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural environment systems
CO4	Student will understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
CO5	Student will apply systems concepts and

	methodologies to analyze and understand interactions between social and environmental processes.
CO6	Elaborate the impact of toxic chemicals on enzymes and biochemical effect of heavy metals.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	50	75

Course Content:

Unit I: Natural resources 10 Hours The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.
Unit II: Ecosystems 10 Hours Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. □□ Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Unit III: Environmental Pollution 10 Hours Environmental Pollution: Air pollution; Water pollution; Soil pollution
Unit VI: Chemical Toxicology 8 Hours Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical

effects of pesticides.

Suggested Reading

Text Books

1. anoharachary C., Reddy P. J., Principles of Environmental Studies, Pharma Book Syndicate, Hyderabad
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill Publishing Company Ltd.
3. Rajagopalan R, Environmental Studies-From Crisis to Cure, Oxford University Press.
4. B. L. Valle & D. D Ulmen Biochemical Effects Of Lead, Cadmium & Mercury

Reference Book

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
2. Clark R.S., Marine Pollution, Clanderson Press Oxford
3. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

Name of The Course	HUMAN ANATOMY AND PHYSIOLOGY-II (Practical) 4 hrs/week			
Course Code	BPHP 2007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

To understand the anatomy and physiology, concepts of health and disease of human body.

Course Outcomes Upon completion of this course the student should be able to:

CO1	Students will able to analyze Different Biological Values of Blood.
CO2	Students will able to analyze Different Biological Values of Vital Organs.

Text Books

1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.

2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

Course Content

1. Introduction to hemocytometry.
2. Enumeration of white blood cell (WBC) count
3. Enumeration of total red blood corpuscles (RBC) count
4. Determination of bleeding time
5. Determination of clotting time
6. Estimation of hemoglobin content
7. Determination of blood group.
8. Determination of erythrocyte sedimentation rate (ESR).
9. Determination of heart rate and pulse rate.
10. Recording of blood pressure.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	PHARMACEUTICAL ORGANIC CHEMISTRY-I (Practical) 4 hrs/week			
Course Code	BPHP 2008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Identification of elements and functional groups in the given organic samples and study of reactions involving acetylation, benzoylation, chlorination, oxidation & reduction.

Course Outcomes Upon completion of this course the student should be able to:

CO1	Analyze the unknown sample with respect to preliminary test
CO2	Analyze the unknown sample with respect to detection of elements.
CO3	Analyze the unknown sample with respect to functional group test.
CO4	Identification of the unknown
CO5	Preparation of the derivatives and confirmation of the unknown compound by melting point/boiling point.

Text Books

1. Mann, F.G, & Saunders, B.C., Practical Organic Chemistry, ELBS/ Longman.
2. Vogel A.I., Textbook of Practical Organic Chemistry, ELBS/Longman.
3. Morrison, R.T., and Boyd R.N., Organic Chemistry, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Finar, I.L., Organic Chemistry, Vol. I & II, ELBS/Longman.

5. Jain, M.K. Organic Chemistry, Sohan Lal Nagin Chand & Co.

60 B, Bunglaw Road, Delhi.

Reference Books

1. Hendrikson, Organic Chemistry.
2. Godly, E.W. "Naming organic compounds".
3. Kalsi," Organic reactions Stereochemistry & Mechanism".

Course Content

I. Systematic qualitative analysis of unknown organic compounds like

1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
3. Solubility test
4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
5. Melting point/Boiling point of organic compounds
6. Identification of the unknown compound from the literature using melting point/ boiling point.
7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
8. Minimum 5 unknown organic compounds to be analysed systematically

II. Preparation of suitable solid derivatives from organic compounds

III. Construction of molecular models

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	BIOCHEMISTRY PRACTICAL 4 hrs./week			
Course Code	BPHP 2009			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

The basic objective of this course is to familiar with naming, mechanism of action and inhibition of enzymes, Metabolism of carbohydrates and lipids, Biological oxidation and energetic of oxidative phosphorylation and bio synthesis and catabolism of amino-acids.

Course Outcomes Upon completion of this course the student should be able to:

CO1	1. Student will gain proficiency in basic laboratory techniques in both chemistry and biology, and be able to apply the scientific method to the processes.
CO2	2. Students will use current biochemical and molecular techniques to plan and carry out experiments through various techniques.
CO3	Student will generate and test hypotheses, analyze data using statistical methods where appropriate, and appreciate the limitations of conclusions drawn from experimental data.
CO4	4. Students will analyze primary literature. This will include evaluation of experimental techniques.
CO5	5. Student will be able to analyze and estimate the various constituent in biological fluids..

Text Books

1. Stryer L., *Biochemistry*, WH, Freeman & Company, San Francisco.

2. Plummer, David J., *An Introduction to Practical Biochemistry*, Tata Mc Graw Hill, New Delhi.

3. Singh S.P., *Practical Manual to Biochemistry*, CBS Publisher, New Delhi.

Reference Book

1. Harpers, *Review of Biochemistry*, Lange Medical Publication.

2. Conn E.E. & Stumph P.K., *Outline of Biochemistry*, John Willery & Sons, New York.

3. Nelson D.L. & Cox M.M., *Lehninger Principles of Biochemistry*, Macmillan Worth Publishers.

Course Content

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks

5	10	35	50
Name of The Course	COMPUTER APPLICATIONS IN PHARMACY (Practical) 2 hrs/week		
Course Code	BPHP 2010		
Prerequisite			
Corequisite			
Antirequisite			
		L	T
		P	C
		0	0
		2	1

Course Objectives: The basic objective of this course is to get familiar with computers and programming Language.

- **Course Outcomes** Upon completion of this course the student should be able to:

CO1	Student will develop a vocabulary of key terms related to the computer and to software program menus
CO2	Student will be able to demonstrate window and menu commands and how they are used.
CO3	Student will be able to demonstrate how to organize files and documents on a USB/hard drive.
CO4	Student will be able to compose, format and edit a word document.
CO5	Student will be able to navigate and search through the internet.

Text Book (s)

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.

2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA

3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1-A, 11 Darya Gani, New Delhi – 110 002(INDIA)

Reference Book (s)

1. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Course Content

1. Design a questionnaire using a word processing package to gather information about a particular disease
2. Create a HTML web page to show personal information
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Continuous Assessment Pattern

Internal Assessment	Sessional Exam	End Term	Total Marks
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(IA)		Test (ETE)	
5	5	15	25

Name of The Course	Pharmaceutical Organic Chemistry-II			
Course Code	BPHT3001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1		4

Course Objectives

1. Understand structure, name and the type of isomerism of the organic compound
2. Explain the orientation of organic reactions.
3. Observe the chemistry of Fats and Oils.
4. Understand the chemistry of polynuclear hydrocarbons.

Course Outcomes

CO1	Recall the basic knowledge of method of preparation, reactions and properties of Benzene and its derivatives
CO2	Demonstrate a high-level understanding of method of preparation, reactions and properties of phenols, aromatic amines and aromatic acids
CO3	Develop basic knowledge of fats and oils and their analytical constants
CO4	Analyze the synthesis, different reactions, properties, structure and medicinal uses of polynuclear hydrocarbons and substituted alkanes
CO5	Assess the stabilities, theory of strainless rings and reactions of cyclo alkanes
CO6	Discuss the newer reactions, determinations and uses of selected organic compounds

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Benzene and its derivatives 10 Hours
A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule. B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation. C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction. D. Structure and uses of DDT, Saccharin, BHC and Chloramine
Unit II: Phenols, Aromatic Amines, Aromatic Acids 10 Hours
A. Phenols- Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols B. Aromatic Amines - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts. C. Aromatic Acids –Acidity, effect of substituents on acidity and important reactions of benzoic acid
Unit III: Fats and Oils 10 Hours
A. Fatty acids – reactions. B. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. C. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination
Unit IV: Polynuclear hydrocarbons 8 Hours
A. Synthesis, reactions B. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives
Unit V: Cyclo alkanes 7 Hours
Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of

strainless rings), reactions of cyclopropane and cyclobutane only

Unit VI: Recent advancements in reactions and analytical methods of selected organic compounds 8 Hours

A. Phenol derivatives from plant sources: structure and medicinal uses of Berberine, Carvacrol, thymol,
B. New trends of diazonium chemistry in aqueous media
C. New analytical methods in oils and fats: Determination of mono, diglycerides, triglycerides, tocopherols in fats and vegetable oils

Suggested Reading

1. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl
2. Organic Chemistry by Morrison and Boyd
3. Indian Pharmacopoeia
4. Arenediazonium salts transformations in water media: Coming round to origins. M.E. Trusova et al. / Resource-Efficient Technologies; Science direct; 2 (2016) 36–42
5. Standard Methods for the Analysis of Oils, Fats and Derivatives. 1st Supplement to the 7th Edition. International Union of Pure and Applied Chemistry, Commission on Oils, Fats and Derivatives

Name of The Course	PHYSICAL PHARMACEUTICS-I			
Course Code	BPHT3002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. To study the graphics techniques, packages and algorithms.
2. To enable the Students to understand the Graphics rendering and hardware.
3. To enable the Students to learn visualization techniques.

Course Outcomes

CO1	Student will able to understand the physicochemical properties of drug molecules, pH, solubility, distribution, adsorption, and stability parameters.
CO2	Students will able to analyze about different states of matter and principles of lyophilization, aerosols, condensed systems, phase diagram and their pharmaceutical applications
CO3	Student will able to analyze and explain the role of surfactants, interfacial phenomenon and thermodynamics in liquid dosage forms.
CO4	Student will able to analyze about concept and application of complexation, protein binding and crystallization.
CO5	Student will able to analyze about concept and application of complexation, protein binding and crystallization.
CO6	The students shall be able to analyze different physical properties with latest equipments.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Test	End Term Test (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Solubility of drugs	10 hours
Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications	
Unit II: States of Matter and properties of matter	10 hours

State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols–inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism. Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications.

Unit III: Surface and interfacial phenomenon

10 hours

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

Unit IV : Complexation and protein binding

8 hours

Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants

Unit V: pH, buffers and Isotonic solutions

7 hours

Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

Unit VI: Advances in Physical Pharmaceutics

08 Hours

Advanced methods for the measurement of different physicochemical properties i.e. Surface tension, Viscosity, Refractive index etc, Software for the pseudo ternary phase diagram drawing, Utilization of MS-excel for different calculations.

Suggested Reading

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.

4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Physical Pharmaceutics by Ramasamy C and ManavalanR
7. Chemix software for phase diagram

Name of The Course	Pharmaceutical Microbiology			
Course Code	BPHT3003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the subject student shall be able to;

1. Students will be able to understand different types of microorganisms.
2. Students will be able to understand about staining, cultivation of microbes and methods of sterilization & sterility testing and microbiological assays.

CO1	The student will be able to understand different types of microorganisms, classification and taxonomy
CO2	The student will be able to understand about staining, cultivation of microbes and methods of sterilization Control
CO3	The student will be able to understand about disinfectants and antiseptics
CO4	The student will be able to understand about aseptic area, laminar flow and microbiological assays
CO5	The student will be able to understand about

	spoilage and application of cell cultures
CO6	The student will understand about recent microbiological based technique used in Diagnosis and Medical Sciences.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

Introd **Introduction of Microbiology**

Intr Introduction, history of microbiology, its branches, scope and its importance, Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy, Nimbus.

Unit II: 10 Hours

Sterilization and Staining of Bacteria

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods Equipments employed in large scale sterilization. Sterility indicators

Unit III:

10Hours

Disinfection, antiseptics and their evaluation

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants
Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions
Evaluation of bactericidal & Bacteriostatic.
Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV 08 Hours

Aseptic area and different microbiological assay

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

Unit V: 07 Hours

Microbial contamination and spoilage.

– Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Unit VI 08 Hours

Recent Advances in Microbiology

Nucleic acid probing and amplification tests,
Cytometry-based antimicrobial resistance techniques,
Breath tests for detection of pathogenic microbes.
Bioanalytical sensors and Biodetection.
Vaccine

Microarray analysis:

Rapid antigen and antibody detection tests.

Name of The Course	Pharmaceutical Engineering			
Course Code	BPHT3004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

- 1.To know various unit operations used in Pharmaceutical industries
- 2.To perform various processes involved in pharmaceutical manufacturing process
- 3.To understand the material handling techniques.
- 4.Pharmaceutical industries significance of plant layout design for optimum use of resources.

Course Outcomes

CO1	The student will able to apply the knowledge to describe phenomenon of flow of fluids i.e., liquid and gases, size reduction and separation for effective good practices on pharmaceutical field
CO2	The student will able to understand and analyse the process and mechanism of heat transfer, evaporation and distillation
CO3	The student will able to apply the concept of drying and mixing process of developing formulation
CO4	The student will able to analyse the Pharmaceutical products by filtration and centrifugation processes
CO5	The student will able to understand basic materials, are used in materials of pharmaceutical plant construction, Corrosion and its prevention technology etc.

CO6	The student will be able to create and know recent advances in fine particle characterization..
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Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

Flow of fluids, Size Reduction and Size Separation

Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

Unit II: 10 Hours

Heat Transfer, Evaporation and Distillation

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.

Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional

distillation, distillation under reduced pressure, steam distillation & molecular distillation

Unit III:

10Hours

Drying And Mixing

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.

Unit IV 08 Hours

Filtration and Centrifugation

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter Medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

Unit V: 07 Hours

Materials of pharmaceutical plant construction, Corrosion and its prevention
Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems

Unit VI 08 Hours

Recent Advances in fine particle characterization:

Importance of particle size in pharmaceutical industry, properties of fine particles, Establishing particle size specifications, Direct method, Brightfield illumination, oblique illumination, Phase contrast illumination, Differential interference contrast illumination, Indirect method, laser diffraction analysis, Advantages and disadvantages of micronization, operational integrity of fine particle, Wadell's true sphericity and circularity, Dallavalle's shape factor, effect of fine particle.

Name of The Course	Pharmaceutical Organic Chemistry II -Practical			
Course Code	BPHP3005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
		0	4	2

LIST OF EXPERIMENTS:

I Experiments involving laboratory techniques

□ Recrystallization □ Steam distillation

II Determination of following oil values (including standardization of reagents) □ Acid value □

Saponification value □ Iodine value

III Preparation of compounds □ Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. □ 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ □ Acetanilide by halogenation (Bromination) reaction. □ 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. □ Benzoic acid from Benzyl chloride by oxidation reaction. □ Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction. □ 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions. □ Benzil from Benzoin by

oxidation reaction. □ Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction □ Cinnamic acid from Benzaldehyde by Perkin reaction □ P-Iodo benzoic acid from P-amino benzoic acid

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Physical Pharmaceutics			
Course Code	BPHP3006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

LIST OF EXPERIMENTS:

Determination the solubility of drug at room temperature

4 Hrs/week

2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.

3. Determination of Partition co-efficient of benzoic acid in benzene and water

4. Determination of Partition co-efficient of Iodine in CCl₄ and water

5. Determination of % composition of NaCl in a solution using phenol-water system by CST method

6. Determination of surface tension of given liquids by drop count and drop weight method

7. Determination of HLB number of a surfactant by saponification method

8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Pharmaceutical Microbiology			
Course Code	BPHP3007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	4	2	

LIST OF EXPERIMENTS:

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.

6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Pharmaceutical Engineering			
Course Code	BPHP3008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

LIST OF EXPERIMENTS:

- I. Determination of radiation constant of brass, iron, unpainted and painted glass.
- II. Steam distillation – To calculate the efficiency of steam distillation.
- III. To determine the overall heat transfer coefficient by heat exchanger.
- IV. Construction of drying curves (for calcium carbonate and starch).
- V. Determination of moisture content and loss on drying.
- VI. Determination of humidity of air – i) From wet and dry bulb temperatures – use of Dew point method.

VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.

VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.

IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.

X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.

XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity

XII. To study the effect of time on the Rate of Crystallization.

XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Pharmaceutical Organic Chemistry III– Theory			
Course Code	BPHT4001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course the student shall be able to

1. Understand the methods of preparation and properties of organic compounds
2. Explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. Know the medicinal uses and other applications of organic compounds
4. Study the mechanism of selected name reactions

Course Outcomes

Upon completion of the course, the student shall be able to:

CO1	Define various aspects of optical isomerism in organic compounds.
CO2	Demonstrate nomenclature and configuration of geometrical isomerism
CO3	Identify the methods of synthesis, reactions and uses of Pyrrole, Furan and Thiophene.
CO4	Compare the synthesis methods and medicinal uses of other heterocyclic compounds.
CO5	Assess the mechanisms of some name reactions of synthetic importance.
CO6	

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Stereo isomerism-Optical isomerism 10 Hours

Optical isomerism:

Optical activity, enantiomerism, diastereoisomerism, meso compounds

Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute.
Unit II: Stereo isomerism-Geometrical isomerism 10 Hours
Geometrical isomerism: Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions.
Unit III: Heterocyclic compounds-I 10 Hours
Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene.
Unit IV: Heterocyclic compounds-II 08 Hours
Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives.
Unit V: Reactions of synthetic importance 07 Hours
Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction

Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation.

Unit VI: Synthesis and Medicinal importance of Imidazole moieties 08 Hours

Imidazoles – Development of synthesis methods, Pharmacological activities, biological significance of imidazole moieties.

Suggested Reading

1. Organic chemistry by I.L. Finar, Volume-I & II..
2. Advanced organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal.
4. Organic Chemistry by Morrison and Boyd.
5. Mossaraf Hossain, Ashis Kumar Nanda. A Review on Heterocyclic: Synthesis and Their Application in Medicinal Chemistry of Imidazole Moiety. Science Journal of Chemistry. Vol. 6, No. 5, 2018, pp. 83-94. doi: 10.11648/j.sjc.20180605.12.

Name of The Course	Medicinal Chemistry-I (Theory)			
Course Code	BPHT4002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objective:

- Understand the chemistry of drugs with respect to their pharmacological activity
- Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- Know the Structural Activity Relationship (SAR) of different class of drugs
- Write the chemical synthesis of some drugs.

Course Outcomes:

At the end of the course, students will be able to:

CO1	remember the concept of drug, receptor and its interaction.
CO2	understand the concept of drug metabolism and prodrug.
CO3	apply the concept of classification, Synthesis, MOA, SAR and uses of drugs acting on the Cholinergic and Adrenergic system.
CO4	apply the concept of classification, Synthesis, MOA, SAR and uses of drugs acting on CNS.
CO5	analyse the concept of classification, Synthesis, MOA, SAR and uses of drugs acting on CNS.
CO6	Create the concept of classification, Synthesis, MOA, SAR and uses of drugs acting on CNS.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Term	End Term Test (ETE)	Total Marks
10	15	75	100

Unit –I: Introduction to Medicinal Chemistry

Introduction to Medicinal Chemistry
 History and development of medicinal chemistry
 Physicochemical properties in relation to biological action
 Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.
 Drug metabolism
 Drug metabolism principles- Phase I and Phase II.
 Factors affecting drug metabolism including stereo chemical aspects.

Unit -II: Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.
 Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.

Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

Unit -III: Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.
Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorophate, Echothiophate iodide, Parathion, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

Unit -IV: Drugs acting on Central Nervous System

Unit -V: Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbiturates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturates: SAR of barbiturates, Barbitol*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital.

Miscellaneous:

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazines: SAR of Phenothiazines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpiride.

C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methobarbital.

Hydantoin: Phenytoin*, Mephenytoin, Ethotoin

Oxazolindione: Trimethadione, Paramethadione

Succinimides: Phensuximide, Methsuximide,

Ethosuximide* Urea and monoacylureas:

Phenacemide, Carbamazepine* Benzodiazepines:

Clonazepam Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate

Unit -V: Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbiturates: Methohexital sodium*, Thiopental sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anileridine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan

Unit VI Molecular properties and drug design

a) Prediction and analysis of ADMET properties of new molecules and its importance in drug design.

b) De novo drug design: Receptor/enzyme-interaction and its analysis, receptor/enzyme cavity size prediction, predicting the functional components of cavities.

c) Introduction to homology modeling and generation of 3D-structure of protein.

Text Books

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.

Reference Books

1. Remington's Pharmaceutical Sciences.
2. Pharmacopoeia of India, The Controller of Publications, Delhi.
3. United States Pharmacopoeia (National Formulary).
4. Atherden L.M., Bentley and Drivers' "Text Book of Pharmaceutical Chemistry", Oxford University Press, London.

Name of The Course	Physical Pharmaceutics-II			
Course Code	BPHT4003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. This subject deals with the following major objectives:
2. Understand various physicochemical properties of drug molecules in the designing the dosage forms
3. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
4. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms
5. To understand about the particles, their properties and the role of micromeretics in powder handling and formulation.
6. To understand about the newtonian systems, Law of flow, kinematic viscosity and complexation, classification of complexes.
7. To understand the colloidal dispersions and their properties with applications.

Course Outcomes

CO 1	Students will able to relate physicochemical properties and kinetics of colloidal dispersion which will help in designing of the dosage forms.
CO 2	Students will able to identify types of flow (rheology) and thixotropic/stability of dispersion and semisolid dosage forms.
CO 3	Students will able to organize the basics involved in formulation and evaluation of coarse dispersion like suspension and emulsion.
CO 4	Students will able to examine fundamental and derived properties of individual particles

	and powder involved in dosage form designing.
CO5	Students will able to interpret chemical kinetics for determining stability of dosage forms.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours
Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action
Unit II: 10 Hours
Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers. Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus.
Unit III: 10Hours Coarse dispersion Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.
Unit IV 10 Hours
Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle

number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties

Unit V: 10Hours
Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

Unit VI 08 Hours

Microparticles: Introduction, classification, Advantages and disadvantages, Drug release mechanism, Formulation techniques, characterization, Application.

Name of The Course	Pharmacology-I Theory			
Course Code	BPHT4004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1		4

Course Objectives

Upon completion of the course, the student shall be able to understand:

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

4. Observe the effect of drugs on animals by simulated experiments

5. Appreciate correlation of pharmacology with other bio medical sciences.

Course Outcomes

CO1	The student will be able to analyse physicochemical properties and kinetics of colloidal dispersion which will help in designing and evaluating the dosage forms
CO2	The student will be able to evaluate the types of flow (rheology) and their measurement, thixotropic/stability of dispersions and semisolid systems.
CO3	The student will be able to analyse the basics involved in formulation and evaluation of coarse dispersion like suspension and emulsion.
CO4	The student will be able to evaluate physicochemical properties of particles involved in dosage form designing.
CO5	The student will be able to apply the principles of chemical kinetics for stability testing of products.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 12 Hours

General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs
. Enzyme induction, enzyme inhibition, kinetics of

elimination.

Unit II: 08 Hours

General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interaction signal transduction mechanisms, G-protein-coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

b. Adverse drug reactions.

c. Drug interactions (pharmacokinetic and pharmacodynamics)

d. Drug discovery and clinical evaluation of new drugs - Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

Unit III: 10 Hours

Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS.

b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.

c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.

d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

e. Local anesthetic agents.

f. Drugs used in myasthenia gravis and glaucoma

Unit IV 08 Hours

Pharmacology of drugs acting on central nervous system

- a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
- b. General anesthetics and pre-anesthetics.
- c. Sedatives, hypnotics and centrally acting muscle relaxants.
- d. Anti-epileptics
- e. Alcohols and disulfiram

Unit V: 07 Hours

Pharmacology of drugs acting on central nervous system

- a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
- b. Drugs used in Parkinsons disease and Alzheimer's disease.
- c. CNS stimulants and nootropics.
- d. Opioid analgesics and antagonists
- e. Drug addiction, drug abuse, tolerance and dependence.

Name of The Course	Pharmacognosy and Phytochemistry I-			
Course Code	BPHT4005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. The basic objective of this course is to get familiar with Pharmacognosy, active constituents, phytochemical screening etc
2. To know the crude drugs, their uses and chemical nature
3. Know the evaluation techniques for the herbal drugs
4. To carry out the microscopic and morphological evaluation of crude drugs

Course Outcomes

CO1	The student will be able to interpret the quality control methods for natural drugs along with scope and development of Pharmacognosy.
CO2	The student will be able to make use of the basic knowledge of cultivation, collection, processing and storage of herbal drugs in the drug development.
CO3	The student will be able to utilize the basic of Plant Tissue Culture (PTC) and techniques involved in the PTC.
CO4	The student will be able to infer the various traditional medicinal systems and drugs used as secondary metabolites.
CO5	The student will be able to conclude the biological source, chemical nature and uses of drugs of natural drugs.
CO6	The students will be able to design novel nutraceuticals.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

**Unit I: Introduction to Pharmacognosy
10 Hours**

Introduction to pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy

(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.
Unit II: Cultivation, Collection, Processing and storage of drugs of natural origin. 10Hours
Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants
Unit III: Plant tissue culture 7 hours
Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines
Unit IV: Pharmacognosy in various systems of medicine: Introduction to secondary metabolites 8 hours
Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins. Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.
Unit V: Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs: 08 Hours
Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). Lipids (Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources
Unit VI Nutraceuticals 08 Hours
General introduction, Classification, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Probiotics, Prebiotics, Dietary fibres, Cereals and grains. Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods.

Suggested Reading

1. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Trease G.E., & Evans W.C., Evans, W.C., Pharmacognosy, Bailliere Tindall east Baorne, U.K.
3. Wallis. T.E., Text Book of Pharmacognosy, J&A Churchill Ltd. London.
4. Tyler V.E. et al, Pharmacognosy, Lea & Febiger, Philadelphia.
5. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th edition, Nirali Prakashan, New Delhi.

Name of The Course	Medicinal Chemistry I – Practical			
Course Code	BPHP4006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
			4	2

Course Objectives

- 1 Understand the chemistry of drugs with respect to their pharmacological activity
- 2 Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- 3 Know the Structural Activity Relationship (SAR) of different class of drugs
- 4 Write the chemical synthesis of some drugs.

Course Outcomes

At the end of the course, students will be able to:

CO1	The student will be able to apply the principles of medicinal chemistry to prepare drugs/intermediates.
CO2	The student will be able to apply the concept of assay of drugs.
CO3	The student will be able to apply the concept of determination of Partition coefficient.

Text Books

1. Remington's Pharmaceutical Sciences.
2. Martindale's extra pharmacopoeia.

Course Content

1	Preparation of 1,3-pyrazole
2	Preparation of 1,3-oxazole
3	Preparation of Benzimidazole
4	Preparation of Benzotriazole
5	Preparation of 2,3- diphenyl quinoxaline
6	Preparation of Benzocaine
7	Preparation of Phenytoin
8	Preparation of Phenothiazine
9	Preparation of Barbiturate
10	Assay of Chlorpromazine
11	Assay of Phenobarbitone
12	Assay of Atropine
13	Assay of Ibuprofen
14	Assay of Aspirin; Assay of Furosemide
15	Determination of Partition coefficient for any two drugs

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	PHYSICAL PHARMACEUTICS- II (Practical)			
Course Code	BPHP4007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

List of Experiments:

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order

11. Accelerated stability studies**Continuous Assessment Pattern**

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	PHARMACOLOGY-I			
Course Code	BPHP4008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

List of Experiments:

Introduction to experimental pharmacology.

2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.

13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.

14. Study of anxiolytic activity of drugs using rats/mice.

15. Study of local anesthetics by different methods
Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	Pharmacognosy and Phytochemistry			
Course Code	BPHP4009			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

LIST OF EXPERIMENTS:

1. Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii) Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index.
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer.
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	Medicinal Chemistry-II			
Course Code	BPHT5001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Course Outcomes

Upon completion of the course, the student shall be able to:

CO1	Understand the basic concepts of cancer, allergy and proton pump in addition to drugs used for their treatment.
CO2	Illustrate the chemical group responsible for evoking a target biological (anti-anginal, antidiuretic and antihypertensive drugs).
CO3	Develop a high level understanding of structure, reactions and mechanism of action in medicinal chemistry (Cardiovascular drugs).
CO4	Analyze the pharmacological actions of drugs acting on endocrine system.

CO5	Determine the basic cause of diabetes, different anti-diabetic drugs and structure activity relationship of local anaesthetics.
CO6	Develop an understanding on biomarker in the treatment of Cardiovascular diseases.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

Antihistaminic agents: Histamine, receptors and their distribution in the human body
H₁-antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylaminesuccinate, Clemastinefumarate, Diphenylp hyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizinehydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadinehydrochloride, Azatidinemaleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromol yn sodium
H₂-antagonists: Cimetidine*, Famotidine, Ranitidin.
Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole
Antineoplastic agents:
Alkylating agents: Meclorothamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa
Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine
Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin
Plant products: Etoposide, Vinblastinsulphate, Vincristinsulphate

ate Miscellaneous: Cisplatin, Mitotane
Unit II: 10 Hours
Antianginal agents: Vasodilators: Amylnitrite, Nitroglycerin*, Pentaerythri toltetranitrate, Isosorbide dinitrite*, Dipyridamole. Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. Diuretics: Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide, Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenzacetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.
Unit III: 10 Hours Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol. Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol Coagulant & Anticoagulants: Menadione, Acetomenadione,

Warfarin*, Anisindione, clopidogrel Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.
Unit IV 08 Hours
Drugs acting on Endocrine system Nomenclature, Stereochemistry and metabolism of steroids Sex hormones: Testosterone, Nandrolone, Progesterones, Oestriol, Oestradiol, Oestrone, Diethyl stilbestrol. Drugs for erectile dysfunction: Sildenafil, Tadalafil. Oral contraceptives: Mifepristone, Norgestrel, Levonorgestrol Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.
Unit V: 07 Hours Antidiabetic agents: Insulin and its preparations Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimpiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acarbose, Voglibose. Local Anesthetics: SAR of Local anesthetics Benzoic Acid derivatives: Cocaine, Hexylcaine, Mepylc aine, Cyclomethycaine, Piperocaine. Amino Benzoic acid derivatives: Benzocaine*, Butambe n, Procaine*, Butacaine, Propoxycaïne, Tetracaine, Benoxinate. Lidocaine/Anilid derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine. Miscellaneous: Phenacaine, Dipiperodon, Dibucaine.*
Unit VI 08 Hours Advancement in biomarker for cardiovascular diseases: Definition, Types, Characteristics, merits and demerits of ideal biomarker; Evaluation and application of biomarker of inflammation, plaque

destabilization, Myocardial Ischemia, cardiac necrosis, haemodynamic stress.

Suggested Reading

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Future biomarkers in cardiology, European Heart Journal Supplements (2018) 20 (Supplement G), G37–G44

Name of The Course	Industrial Pharmacy-I			
Course Code	BPHT5002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course Outcomes

CO 1	The student will be able to understand the concept of physicochemical properties of drug substances and application of preformulation in designing of different dosage form.
CO 2	The student will be able to illustrate different methods for formulation and evaluation of

tablets and liquid dosage forms.

CO 3	The student will be able to identify specific techniques for formulation and evaluation of capsule shells & pellets.
CO 4	The student will be able to distinguish quality requirements for formulation and evaluation of parenteral and ophthalmic dosage forms in all aspects.
CO 5	The student will be able to analyse about the importance of formulation and evaluation of cosmetics, pharmaceutical aerosols and packaging in growth of pharmaceutical industry.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization. BSC classification of drug and its significance.

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

Unit II: 10 Hours

Tablets:

Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.

Tablet coating: Types of coating, coating materials,

formulation of coating composition, methods of coating, equipment employed and defects in coating.

Quality control tests: In process and finished product tests

Liquidorals: Formulation and manufacturing considerations of syrups and elixirs, suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

Unit III: 10Hours

Capsules

a.

Hard gelatin capsules: Introduction, Production of hard gelatin capsules, shells, size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects.

In process and final product quality control tests for capsules.

b. Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minimum/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

Unit IV 8Hours

Parenteral Products: a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity

b. Production

procedure, production facilities and controls, aseptic processing

c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.

d. Containers and closure selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of

preparation; labeling, containers; evaluation of ophthalmic preparations.

Unit V: 10Hours

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, toothpastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

Unit VI 08 Hours

Novel Formulation: Aquasomes: -Introduction to novel drug delivery system, Importance, Advantages and Disadvantages, Literature discussion, Exception used of formulation, Formulation designing, Application of aquasomes.

Name of The Course	PHARMACOLOGY- III (Theory)			
Course Code	BPHT5003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments

3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Outcomes

CO1	The student will be able to illustrate the general concepts of pharmacodynamics and pharmacokinetics of drugs acting on CVS
CO2	The student will be able to analyze the mechanism of action, uses and adverse effects of drugs acting on hemopoietic system, coagulants, anticoagulants, fibrinolytics and urinary system
CO3	The student will be able to apply the pharmacological knowledge of drugs acting on autacoids, NSAIDs, anti-gout and anti-rheumatic drugs dealing with the mechanism of action, uses, interactions and side effects of drugs on body
CO4	The student will be able to apply the pharmacological knowledge of drugs acting on endocrine system
CO5	The student will be able to apply the pharmacological knowledge of principles and applications of bioassay, bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Unit-1 10 hours
1. Pharmacology of drugs acting on cardio vascular system a. Introduction to hemodynamic and electrophysiology of heart. b. Drugs used in congestive heart failure c. Anti-hypertensive drugs. d. Anti-anginal drugs. e. Anti-arrhythmic drugs.

f. Anti-hyperlipidemic drugs.
Unit-2 10 Hours
1. Pharmacology of drugs acting on cardio vascular system a. Drug used in the therapy of shock. b. Hematinics, coagulants and anticoagulants. c. Fibrinolytics and anti-platelet drugs d. Plasma volume expanders 2. Pharmacology of drugs acting on urinary system a. Diuretics b. Anti-diuretics.
Unit-3 10 Hours
Autocoids and related drugs a. Introduction to autacoids and classification b. Histamine, 5-HT and their antagonists. c. Prostaglandins, Thromboxanes and Leukotrienes. d. Angiotensin, Bradykinin and Substance P. e. Non-steroidal anti-inflammatory agents f. Anti-gout drugs g. Anti-rheumatic drugs
Unit-4 8 Hours
Pharmacology of drugs acting on endocrine system a. Basic concepts in endocrine pharmacology. b. Anterior Pituitary hormones- analogues and their inhibitors. c. Thyroid hormones- analogues and their inhibitors. d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D. d. Insulin, Oral Hypoglycemic agents and glucagon. e. ACTH and corticosteroids.
Unit-5 7 Hours
Pharmacology of drugs acting on endocrine system a. Androgens and Anabolic steroids. b. Estrogens, progesterone and oral contraceptives. c. Drugs acting on the uterus. Bioassay a. Principles and applications of bioassay. b. Types of

bioassay

c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT

Unit 6

Free radicals Pharmacology, Generation of free radicals, role of free radicals in etiopathology of various disease such as diabetes, neurodegenerative disorders and cancer. Protective activity of certain important antioxidant, Recent advancement in treatment of Alzheimer disease, Parkinson disease, cancer and Diabetes mellitus.

Text Book (s)

Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier

Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.

Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert.

Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

Reference Book (s)

Goodman and Gilman's, The Pharmacological Basis of Therapeutics

Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.

K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point
Lippincott Williams & Wilkins.

Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.

K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

Course	PhytochemistryII-Theory			
Course Code	BPHT5004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. Know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. Understand the preparation and development of herbal formulation
3. Understand the herbal drug interactions
4. Carryout isolation and identification of phytoconstituents

Course Outcomes

CO1	The students will be able to identify the biogenetic and biosynthetic pathways involved in higher plants
CO2	The students will be able to identify the drugs of natural origin by chemical tests, organoleptic, morphological, microscopical, characters. Also apply these parameters to distinguish drug from possible adulterant.
CO3	The students will be able to conclude the isolation, Identification and Analysis of Phytoconstituents
CO4	The students will be able to justify Industrial production, estimation and utilization of the following phytoconstituents
CO5	The students will be able to analyze the methods of extraction, spectroscopy , chromatography and electrophoresis
CO6	The students will be able to design methods in Pharmacovigilance of Drugs of Natural Origin.

Continuous Assessment Pattern

Internal Assessment	Sessional Exam	End Term	Total Marks
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Name of The	Pharmacognosy and
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(IA)		Exam (ETE)	
10	15	75	100

Course Content:

Unit I: Metabolic pathways in higher plants and their determination 08 Hours
a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways-Shikimic acid pathway, Acetate pathways and Amino acid pathway.
b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.
Unit II: General introduction, composition, chemistry & chemical classes, bio sources, therapeutic uses and commercial applications of following secondary metabolites: 10 Hours
Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony Glycosides: Senna, Aloes, Bitter Almond Iridoids, Other terpenoids & Naphtha quinones: Gentian, Artemisia, taxus, carotenoids
Unit III: Isolation, Identification and Analysis of Phytoconstituents 10 Hours
a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrrhetic acid & Rutin c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine d) Resins: Podophyllotoxin, Curcumin
Unit IV: Industrial production, estimation and utilization of the following phytoconstituents 10 Hours
Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine,

Taxol, Vincristine and Vinblastine
Unit V: Basics of Phytochemistry 07 Hours
Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.
Unit VI: Pharmacovigilance of Drugs of Natural Origin 08 Hours
Pharmacovigilance of Drugs of Natural Origin WHO and AYUSH guidelines for safety monitoring of natural medicine Spontaneous reporting schemes for bio-drug adverse reactions Bio drug-drug and bio drug-food interactions with suitable examples

Suggested Reading

1. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Trease G.E., & Evans W.C., Evans, W.C., Pharmacognosy, Bailliere Tindall east Baorne, U.K.
3. Wallis. T.E., Text Book of Pharmacognosy, J&A Churchill Ltd. London.
4. Tyler V.E. et al, Pharmacognosy, Lea & Febiger, Philadelphia.
5. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th edition, Nirali Prakashan, New Delhi.

Name of The Course	Pharmaceutical Jurisprudence			
Course Code	BPHT5005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Outcomes

CO1	Student will be able to conclude the basic concept of different pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
CO2	Students will be able to compare various acts and laws of Indian pharmaceutical.
CO3	Students will be able to identify the importance and role of different regulatory authorities and other governing agencies in the manufacture and sale of pharmaceuticals.
CO4	Students will be able to classify the drug & magic remedies act and animal ethics committee.
CO5	Students will be able to classify the code of ethics in pharmaceutical practice.
CO6	Students will be able to know new amendments of different acts.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	25	75	100

Course Content:

Unit I: 10 Hours
Drug and Cosmetic Act 1940 and its rules 1945: Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics

prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

Unit II: 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:
Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA)
Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.
Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors.

Unit III: 10 Hours

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties.

Medicinal and Toilet Preparation Act –1955:
Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations.
Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-

1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties.

Unit IV 08 Hours

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

Unit V: 07 Hours

Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

Code of Pharmaceutical ethics: Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)

Unit VI 08 Hours

Amendments of Act: Drugs and Cosmetics Act, 1940 and its rules 1945, Medicinal and Toilet Preparation Act-1955, Prevention of Cruelty to animals Act, Drugs Prices Control, Drugs and Magic Remedies Act and its rules, Medical Termination of Pregnancy Act

Name of The Course	Industrial Pharmacy-I Lab			
Course Code	BPHT5006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Content

1. Preformulation studies on

paracetamol/aspirin/or any other drug

- Preparation and evaluation of Paracetamol tablets
- Preparation and evaluation of Aspirin tablets
- Coating of tablets-film coating of tablets/granules
- Preparation and evaluation of Tetracycline capsules
- Preparation of Calcium Gluconate injection
- Preparation of Ascorbic Acid injection
- Quality control test of (as per IP) marketed tablets and capsules
- Preparation of Eye drops/ and Eye ointments
- Preparation of Creams (cold /vanishing cream)
- Evaluation of Glass containers (as per IP)

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Pharmacology II – Lab
Course Code	BPHT5007
Prerequisite	

Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Content

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRCo of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRCo of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA₂ value of prazosin using rat aortic smooth muscle (by Schild's plot method).
12. Determination of PD₂ value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Continuous Assessment Pattern

Internal	Sessional	End	Total
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Assessment (IA)	Exam	Term Test (ETE)	Marks	
5	10	35	50	
Name of The Course	Pharmacognosy and Phytochemistry II - Lab			
Course Code	BPHT5008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Content

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
 - a) Caffeine- from tea dust.
 - b) Diosgenin from Dioscorea
 - c) Atropine from Belladonna
 - d) Sennosides from Senna
3. Separation of sugars by Paper chromatography.
4. TLC of herbal extract.
5. Distillation of volatile oils and detection of phytoconstituents by TLC.
6. Analysis of crude drugs by chemical tests:
 - i. Asafoetida
 - ii. Benzoin
 - iii. Colophony
 - iv. Aloes
 - v. Myrrh

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	Medicinal Chemistry-III
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Course Code	BPHT6001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course the student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs

Course Outcomes:

Upon completion of the course, the student shall be able to:

CO1	Relate the fundamental knowledge and effects of β -lactam antibiotics, aminoglycosides and tetracyclines.
CO2	Relate the fundamental knowledge including stereochemistry, structure activity relationship, and classification of antimalarial and antibiotic agents.
CO3	Build the SAR of anti-tubercular, urinary tract anti-infective and anti-viral agents.
CO4	Analyze the role of anti-fungal and anti-protozoal agents.
CO5	Evaluate the concepts of drug designing and combinatorial chemistry.
CO6	Develop an understanding on molecular properties used in drug design.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam	Total Marks
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		(ETE)	
10	15	75	100

Course Content:

Unit I: 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

β -Lactam antibiotics: Penicillin, Cephalosporins, β -Lactamase inhibitors, Monobactams
Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

Unit II: 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Macrolide: Erythromycin, Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrug design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides

and dihydrotriazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone.

Unit III: 10 Hours

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino

salicylic acid.*

Anti-tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine, Streptomycin, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*,

Ofloxacin, Lomefloxacin, Sparfloxacin,

Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*,

Methanamine.

Antiviral agents:

Amantadine hydrochloride,

Rimantadine hydrochloride, Idoxuridine trifluoride,

Acyclovir*,

Gancyclovir, Zidovudine, Didanosine, Zalcitabine,

Lamivudine, Loviride, Delavirding, Ribavirin,

Saquinavir, Indinavir, Ritonavir.

Unit IV 08 Hours

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole,

Econazole, Butoconazole, Oxiconazole, Tioconazole,

Miconazole*, Ketoconazole, Terconazole,

Itraconazole, Fluconazole, Naftifine hydrochloride,

Tolnaftate*.

Anti-

protozoal Agents: Metronidazole*, Tinidazole, Ornidazole,

Diloxanide, Idoquinol, Pentamidine Isethionate,

Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole,

Mebendazole*, Albendazole, Niclosamide,

Oxamniquine, Praziquantel, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR

of Sulfonamides:

Sulphamethizol, Sulfisoxazole, Sulphamethizol, Sulfacetamide

Sulphapyridine, Sulfamethoxazole, Sulphadiazine, Mefenacetate

Sulfasalazine

Folate reductase inhibitors: Trimethoprim*,

Cotrimoxazole.

Sulfones: Dapsone*.

Unit V: 07 Hours

Introduction to Drug Design

Various approaches in drug design

Physicochemical parameters used in

quantitative structure activity relationship (QSAR) such

as partition coefficient, Hammett's electronic

parameter, Taft's steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of

combinatorial chemistry: solid phase and solution

phases synthesis.

Unit VI 08 Hours

Molecular properties and drug design

a) Prediction and analysis of ADMET properties of new molecules and its importance in drug design.

b) De novo drug design: Receptor/enzyme-interaction and its analysis, receptor/enzyme cavity size prediction, predicting the functional components of cavities.

c) Introduction to homology modeling and generation of 3D-structure of protein.

Suggested Reading

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.

Name of The Course	PHARMACOLOGY-III (Theory)			
Course Code	BPHT6002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of this course the student should be able to:

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. Comprehend the principles of toxicology and treatment of various poisonings and
3. Appreciate correlation of pharmacology with related medical sciences.

Course Outcomes

CO1	Analyze the pharmacology of drugs acting on respiratory system, as well as Correlate the Pharmacology of drugs like anti-emetics, anti-ulcerative agents acting on the Gastrointestinal Tract
CO2	Relate the pharmacology of chemotherapeutic agents like Penicillin, cephalosporin, chloramphenicol, macrolides, quinolones, fluoroquinolone, tetracycline and aminoglycosides
CO3	Analyze the pharmacology of chemotherapeutic agents – Anti tubercular, anti leprotic antifungal, antiviral drugs, anthelmintic, antimalarial drugs, anti-amoebic agents.
CO4	Correlate the pharmacology of chemotherapy with Urinary tract infections and sexually transmitted diseases
CO5	Analyze the principles of toxicology for the treatment and management of barbiturates, morphine, organo-phosphorus compound and lead, mercury and arsenic poisoning.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

10 hours

1. Pharmacology of drugs acting on Respiratory system

- a. Anti -asthmatic drugs
- b. Drugs used in the management of COPD
- c. Expectorants and antitussives
- d. Nasal decongestants
- e. Respiratory stimulants

2. Pharmacology of drugs acting on the Gastrointestinal Tract

- a. Antiulcer agents.
- b. Drugs for constipation and diarrhoea.
- c. Appetite stimulants and suppressants.
- d. Digestants and carminatives.
- e. Emetics and anti-emetics.

Unit-2

10 Hours

Chemotherapy

a. General principles of chemotherapy.

b. Sulfonamides and cotrimoxazole.

c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

Unit-3

10 Hours

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine

Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Unit-1

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.
Unit-4 8 Hours
Chemotherapy a. Antitubercular agents b. Antileprotic agents c. Antifungal agents d. Antiviral drugs e. Anthelmintics f. Antimalarial drugs g. Antiamoebic agents Urinary tract infections and sexually transmitted diseases. m. Chemotherapy of malignancy. Immunopharmacology a. Immunostimulants b. Immunosuppressant Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars
Unit-5 7 Hours
. Principles of toxicology a. Definition and basic knowledge of acute, subacute and chronic toxicity. b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity c. General principles of treatment of poisoning d Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning. 6. Chronopharmacology a. Definition of rhythm and cycles. b. Biological clock and their significance leading to chronotherapy. Mode of Evaluation: The theory and lab performance of students are evaluated separately.

Text Book (s)

Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,

Churchil Livingstone Elsevier

Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.

Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert.

Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

Reference Book (s)

Goodman and Gilman's, The Pharmacological Basis of Therapeutics

Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.

K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point
Lippincott Williams & Wilkins.

Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.

K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

Name of The Course	Herbal Drug Technology-Theory			
Course Code	BPHT6003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objective

1. **Student should gain knowledge of basic understanding of herbal drug industry, the quality of raw material**
2. **Students should be familiar with guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc.**

3. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Course Outcomes

CO1	understand raw material as source of herbal drugs from cultivation to herbal drug product
CO2	know the WHO and ICH guidelines for evaluation of herbal drugs
CO3	know the herbal cosmetics, natural sweeteners, nutraceuticals
CO4	appreciate patenting of herbal drugs, GMP
CO5	Understand the parts and function of herbal industry

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 11 Hours

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material.

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants:

Biopesticides/Bioinsecticides

Indian Systems of Medicine

- Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy
- Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

Unit II: 7 Hours

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina.

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

Unit III: 10 Hours

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

Unit IV : 10 Hours

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs

Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:

- Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy

- Patenting aspects of Traditional Knowledge and

<p>Natural Products. Case study of Curcuma & Neem.</p> <p>Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.</p>	
Unit V:	7 Hours
<p>General Introduction to Herbal Industry</p> <p>Herbal drugs industry: Present scope and future prospects.</p> <p>A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.</p> <p>Schedule T – Good Manufacturing Practice of Indian systems of medicine</p> <p>Components of GMP (Schedule – T) and its objectives</p> <p>Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.</p>	
Unit VI :	8 Hours
Industrial design of proprietary herbal medicine	
<p>References: 1. Textbook of Pharmacognosy by Trease & Evans.</p> <p>2. Textbook of Pharmacognosy by Tyler, Brady & Robber.</p> <p>3. Pharmacognosy by Kokate, Purohit and Gokhale</p> <p>4. Essential of Pharmacognosy by Dr.S.H.Ansari</p> <p>5. Pharmacognosy & Phytochemistry by V.D.Rangari</p>	

Name of The Course	Biopharmaceutics and Pharmacokinetics
Course Code	BPHT6004
Prerequisite	
Co-requisite	
Anti-requisite	

	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

Course Outcomes

CO1	Student will be able to compare the basic concept of in biopharmaceutics and pharmacokinetics and their significance.
CO2	Students will be able to develop different pharmacokinetics parameters through drug plasma concentration and time data.
CO3	Students will be able to develop concepts of bioavailability and bioequivalence of drug products and their significance.
CO4	Students will be able to identify various pharmacokinetic parameters, their significance & applications.
CO5	Students will be able to classify the different factor responsible for the nonlinear Pharmacokinetics and their significance.
CO6	The student will be able to create and know recent advances in fine particle characterization.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam	Total Marks
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		(ETE)	
10	15	75	100

Course Content:**Unit I: 10 Hours****Introduction to Biopharmaceutics**

Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug from Non per oral extra-vascular routes,

Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

Unit II: 10 Hours

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

Unit III: 10 Hours

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous

Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E , $t_{1/2}$, V_d , AUC , K_a , Cl_t and CL_R - definitions methods of eliminations, understanding of their significance and application

Unit IV 08 Hours

Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

Unit V: 07 Hours

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Name of The Course	Pharmaceutical Biotechnology			
Course Code	BPHT6005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries

2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries

4. Appreciate the use of microorganisms in fermentation technology

Course Outcomes

C O1	Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
C O2	Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
C O3	Biotechnology has already produced, Immunology and transgenic crops and animals and the future promises lot more.
C O4	It is basically a research-based Immuno assay and immuno blotting
C O5	Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
C O6	Students will be able to know new amendments of Biotechnology and their Application

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	25	75	100

Course Content:

Unit I: 10 Hours
Introduction of biotechnology their application
a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
c) Biosensors- Working and applications of biosensors in

Pharmaceutical Industries.

d) Brief introduction to Protein Engineering.

e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.

f) Basic principles of genetic engineering.

Unit II: 10 Hours

Recombinant DNA technology and Genetics engineering

- a) Study of cloning vectors, restriction endonucleases and DNA ligase.
- b) Recombinant DNA technology. Application of genetic engineering in medicine.
- c) Application of rDNA technology and genetic engineering in the production of:
 - i) Interferon
 - ii) Vaccines-hepatitis-B
 - iii) Hormones-Insulin.
- d) Brief introduction to PCR

Unit III: 10 Hours

Immunology and their application

- Types of immunity-humoral immunity, cellular immunity
- a) Structure of Immunoglobulins
 - b) Structure and Function of MHC
 - c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
 - d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
 - e) Storage conditions and stability of official vaccines
 - f) Hybridoma technology-Production, Purification and Applications
 - g) Blood products and Plasma Substitutes.

Unit IV 08 Hours

Immuno Assay and immuno blotting technique

- a) Immuno blotting techniques-ELISA, Western blotting, Southern blotting.
- b) Genetic organization of Eukaryotes and Prokaryotes
- c) Microbial genetics including transformation,

transduction, conjugation, plasmids and transposons. d) Introduction to Microbial biotransformation and applications. e) Mutation: Types of mutation/mutants.	3. Understanding the scope of quality certifications applicable to pharmaceutical industries 4. Understanding the responsibilities of QA & QC departments								
Unit V: 07 Hours Fermentation Technology and their application Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. b) Large scale production fermenter design and its various controls. c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma substitutes.	Course Outcomes								
Unit VI 08 Hours Recent development of Biotechnology and their application in Pharmacy, Medicine, Vaccine, Fermentation, Agriculture, Dairy Etc	CO1 The students are able to understand the cGMP aspects in a pharmaceutical industry CO2 The students are able to understand importance of documentation CO3 The students are able to understand the scope of quality certifications applicable to pharmaceutical industries CO4 The students are able to understand responsibilities of QA & QC departments CO5 The students are able to understand validation of instruments CO6 The students are able to apply different software for experimental design and quality assurance processes								
	Continuous Assessment Pattern								
	<table border="1"> <thead> <tr> <th>Internal Assessment (IA)</th> <th>Sessional Test (Sessional Exam)</th> <th>End Term Test (ETE)</th> <th>Total Marks</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>15</td> <td>75</td> <td>100</td> </tr> </tbody> </table>	Internal Assessment (IA)	Sessional Test (Sessional Exam)	End Term Test (ETE)	Total Marks	10	15	75	100
Internal Assessment (IA)	Sessional Test (Sessional Exam)	End Term Test (ETE)	Total Marks						
10	15	75	100						

Name of The Course	PHARMACEUTICAL QUALITY ASSURANCE			
Course Code	BPHT6006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. Understanding of cGMP aspects in a pharmaceutical industry
2. Appreciate the importance of documentation

Unit-1

10 hours

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

Quality by design (QbD): Definition, overview, elements of QbD program, tools

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

NABL accreditation : Principles and procedures	
Unit II: 10 Hours	
Organization and personnel: Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.	
Unit III: 10 Hours	III:
Quality Control: Quality control test for containers, rubber closures and secondary packing materials. Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities	
Unit IV: 08 Hours	08
Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal. Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.	
Unit V: 07Hours	
Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical	

method Validation.

Warehousing: Good warehousing practice, materials management

Unit VI Advancements in Quality Assurance:
07 Hours

Calculation of stability parameters by conventional method and Arrhenius method, Different models for experimental design, Software for implementation of QbD.

Suggested Reading

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. Good laboratory Practices – Marcel Dekker Series
8. ICH guidelines, ISO 9000 and 14000 guidelines

Name of The Course	Medicinal Chemistry-III (Practical)			
Course Code	BPHT6007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Content

- | | |
|---|--|
| I | Preparation of drugs and intermediates |
| 1 | Sulphanilamide |
| 2 | 7-Hydroxy, 4-methylcoumarin |
| 3 | Chlorobutanol |
| 4 | Triphenyl imidazole |
| 5 | Tolbutamide |

- 6 Hexamine
 II Assay of drugs
 1 Isonicotinic acid hydrazide
 2 Chloroquine
 3 Metronidazole
 4 Dapsone
 5 Chlorpheniramine maleate
 6 Benzyl penicillin
 III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique
 IV Drawing structures and reactions using chem draw®
 V Determination of physicochemical properties such as log P, clog P, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinski's RO5)

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	PHARMACOLOGY-III (Practical)			
Course Code	BPHT6008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Content

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and

NSAIDs induced ulcer model.

4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- auto analyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology (student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	HERBAL DRUG TECHNOLOGY (Practical)			
Course Code	BPHT6009			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Content

1. To perform preliminary phytochemical screening of crude drugs.

- Determination of the alcohol content of Asava and Arista
- Evaluation of excipients of natural origin
- Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
- Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
- Monograph analysis of herbal drugs from recent Pharmacopoeias
- Determination of Aldehyde content
- Determination of Phenol content
- Determination of total alkaloids

- Perform quantitative & qualitative analysis of drugs using various analytical instruments

Course Outcomes

CO1	Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
CO2	Understand the chromatographic separation and analysis of drugs.
CO3	Perform quantitative & qualitative analysis of drugs using various analytical instruments
CO4	Apply analytical knowledge in solving drug interaction problems

Continuous Assessment Pattern

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

UV Visible spectroscopy

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

Unit II: 10 Hours

Name of The Course	Instrumental Methods of Analysis – Theory			
Course Code	BPHT7001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objective

Upon completion of the course the student shall be able to

- Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
- Understand the chromatographic separation and analysis of drugs.

<p>IR spectroscopy Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications Flame Photometry-Principle, interferences, instrumentation and applications Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications Nepheloturbidometry- Principle, instrumentation and applications</p>
Unit III: 10 Hours
<p>Introduction to chromatography Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications. Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications. Paper Chromatography- Introduction, methodology, development techniques, advantages, disadvantages and applications</p> <p>Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications</p>
Unit IV : 8 Hours
<p>Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.</p>
Unit V: 7 Hours

<p>Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications Gel chromatography- Introduction, theory, instrumentation and applications Affinity chromatography- Introduction, theory, instrumentation and applications</p>
Unit VI : 8 Hours
<p>Scanning Electron Microscopy and Transmission electron Microscopy: Principle of Image formation, Concept of resolution and magnification, Instrumentation and its application in pharmacy.</p>
<p>References: 1. Instrumental Methods of Chemical Analysis by B.K Sharma 2. Organic spectroscopy by Y.R Sharma 3. Text book of Pharmaceutical Analysis by Kenneth A. Connors 4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel 5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 6. Organic Chemistry by I. L. Finar 7. Organic spectroscopy by William Kemp 8. Quantitative Analysis of Drugs by D. C. Garrett 9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi 10. Spectrophotometric identification of Organic Compounds by Silverstein 11. Skoog, Douglas A., F. James Holler, and Stanley R. Crouch. Principles of instrumental analysis. Cengage learning, 2017. 12. Braun, R.D. and Braun, R.D., 1987. Introduction to instrumental analysis.</p>

Name of The Course	Industrial Pharmacy-II
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Course Code	BPHT7002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

Course Outcomes

CO1	Students will be able to recall the process of pilot plant scale up of pharmaceutical products
CO2	Students will be able to illustrate the process of technology transfer from lab scale to commercialization
CO3	Students will be able to apply the concept of Regulatory affairs for drug approval
CO4	Students will be able to assess the concept of Quality by Design
CO5	Students will be able to apprise the approval procedure for new drugs
CO6	Students will be able to compile the recent advances in drug development process

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam)	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: Pilot plant scale up techniques	10
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Hours

General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

Unit II: Technology development and transfer: WHO guidelines for Technology Transfer(TT) 10 Hours

Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

Unit III: Regulatory affairs 10 Hours

Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

Unit IV: Quality management systems 08Hours

Quality management & Certifications: Concept of

Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

Unit V: Indian Regulatory Requirements

07 Hours

Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Unit VI: Recent Advances in Industrial Pharmacy
08 Hours

Recent Advances in Pilot Plant scale up techniques, Applications of Quality by design technique in pharmaceutical product development, ICH guidelines for stability, Recent advances in platform technique.

Suggested Reading

1. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.

2. Regulatory Affairs brought by learning plus, inc. available at <http://www.cgmp.com/ra.htm>.

3. Dimple modi et al., Accelerate development of topical cream drug product using a common platform base formulation, Pharmaceutical Development and Technology, vol. 25, 2020.

4. Avinash V. Dhobale*1, Arun M. Mahale2, Mrunal Shirsat3, Shriram Pethkar4, Vijay Chakote5, RECENT ADVANCES IN PILOT PLANT SCALE UP TECHNIQUES - A Review, Indo American Journal of Pharmaceutical Research, 2018.

5. Michele Herneisey 1, Eric Lambert 1, Allison Kachel 1, Emma Shychuck 1, James K. Drennen III 1 and Jelena M. Janjic1,2, Quality by Design

Approach Using Multiple Linear and Logistic Regression Modeling Enables Microemulsion Scale Up, Molecules 2019, 24, 2066; doi:10.3390/molecules24112066.

Name of The Course	Pharmacy Practice			
Course Code	BPHT7003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objective

- Know various drug distribution methods in a hospital
- Appreciate the pharmacy stores management and inventory control
- Monitor drug therapy of patient through medication chart review and clinical review
- Identify drug related problems.

Course Outcomes

CO1	Analyze the classification, organization, functions of hospital pharmacy, ADRs, drug interactions and its management.
CO2	Analyze the types of drug distribution system, hospital formulary and its preparation, therapeutic drug monitoring, medication adherence, patient medication history.
CO3	Analyze the work of Pharmacy and therapeutic committee, Drug information services, Patient counseling, medication order and communication skills
CO4	Evaluate Budget preparation and implementation, and analyze the concept of clinical pharmacy for Pharmaceutical care and rational use of over the counter
CO5	Analyze drug store management and inventory control as well as Investigational use of drugs.
CO6	The students will be able to understand about Telepharmacy and epidemiological studies.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam ()	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: 10 Hours

A) Hospital and its organization

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non-clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions..

b) Hospital pharmacy and its organization

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

d) Community Pharmacy

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

Unit II: Principles and significance of professional Ethics.

10 Hours

a) Drug distribution system in a hospital
Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

b) Hospital formulary
Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

c) Therapeutic drug monitoring
Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

d) Medication adherence
Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

e) Patient medication history interview
Need for the patient medication history interview, medication interview forms.

f) Community pharmacy management
Financial, materials, staff, and infrastructure requirements

Unit III: 10 Hours

a) Pharmacy and therapeutic committee
Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

b) Drug information services
Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

c) Patient counseling
Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

d) Education and training program in the hospital
Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics,

Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.
e) Prescribed medication order and communication skills
Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

Unit IV : 8 Hours

Budget preparation and implementation

b) Clinical Pharmacy

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist,

Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.

Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

c) Over the counter (OTC) sales

Introduction and sale of over the counter, and Rational use of common over the counter medications..

Unit V: 7 Hours

a) Drug store management and inventory control
Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

b) Investigational use of drugs
Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

b) Interpretation of Clinical Laboratory Tests
Blood chemistry, hematology, and urinalysis.

Unit VI : 8 Hours

Epidemiological study design, Home Care, Self

Prescription, TelePharmacy

References: Pharmacy Practice Edited by Kevin M.G.Taylor, School of Pharmacy, University of London, London, UK and Geoffrey Harding Department of General Practice and Primary Care, St Bartholomew's and the Royal London School of Medicine and Dentistry Queen Mary, University of London, London, UK

**<https://www.youtube.com/watch?v=bg-LnEIFxpw> ,
<https://www.youtube.com/watch?v=MEFTuDjnfOY>**

Name of The Course	Novel Drug Delivery System – Theory			
Course Code	BPHT7004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

1. Basic principles and concepts for the manufacturing of controlled drug delivery systems.
2. Application of principles of control delivery for the design of different novel drug delivery systems.
3. The evaluation techniques for different novel drug delivery systems.

Course Outcomes

CO1	The student will be able to apply the concepts of controlled drug delivery systems for the formulation of therapeutic systems.
CO2	The student will be able to apply the concepts of microencapsulation, mucosal delivery and implants for different pathological conditions.
CO3	The student will be able to apply the concept of transdermal, nasopulmonary and gastroretentive drug delivery systems.

CO4	The student will be able to relate the formulation concepts for the preparation of different systems for targeted drug delivery.
CO5	The student will be able to apply the concepts of ocular and intrauterine delivery of related therapeutics.
CO6	The student will be able to formulate and evaluate the graphene based drug delivery systems.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1: 10 Hours
<p>Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion-exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations</p> <p>Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.</p>
Unit-2 10 hours
<p>Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications</p> <p>Mucosal Drug Delivery system: Introduction, Principles of bio-adhesion/ muco-adhesion, concepts, advantages and disadvantages,</p>

trans mucosal permeability and formulation considerations of buccal delivery systems
<p>Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump</p>
Unit-3 10 hours
<p>Trans-dermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches</p> <p>Gastro-retentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS–Floating, high density systems, inflatable and gastro adhesive systems and their applications</p> <p>Naso-pulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers.</p>
Unit-4 8 hours
Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications.
Unit-5 7 hours
<p>Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts</p> <p>Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intrauterine devices (IUDs) and applications</p>
Unit-6 8 hours
<p>Graphene and carbon Nano tubes: Introduction to Graphene and Carbon nano tubes based drug delivery systems. Types, synthesis, classification and application, Its advantages,</p>

disadvantages and side effects.

Name of The Course	INSTRUMENTAL METHODS OF ANALYSIS (Practical)			
Course Code	BPHP7005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

To get familiar with the analysis of drugs based on their spectral data. To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel.

Course Outcomes

CO1	The student will be able to analyze the quantitative estimation of drugs by UV spectroscopy and estimation of dextrose and sulfanilamide by colorimetry.
CO2	The student will be able to illustrate about quenching of fluorescence and estimation of quinine sulfate by fluorimetry.
CO3	The student will be able to analyze sodium, potassium, chlorides and sulphates by flame photometry and nepheloturbidometry.
CO4	The student will be able to analyze the separation of amino acids, sugars and plant pigments by paper, thin layer and column

chromatography.

CO5	The student will be able to illustrate about demonstration experiment on HPLC and gas chromatography.
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Text Book (s):

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors

Reference Book (s)

1. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
2. Organic Chemistry by I. L. Finar
3. Organic spectroscopy by William Kemp
4. Quantitative Analysis of Drugs by D. C. Garrett

List of Experiments	
1	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2	Estimation of dextrose by colorimetry
3	Estimation of sulfanilamide by colorimetry
4	Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5	Assay of paracetamol by UV-Spectrophotometry
6	Estimation of quinine sulfate by fluorimetry
7	Study of quenching of fluorescence
8	Determination of sodium by flame photometry
9	Determination of potassium by flame photometry
10	Determination of chlorides and sulphates by nepheloturbidometry
11	Separation of amino acids by paper chromatography
12	Separation of sugars by thin layer chromatography
13	Separation of plant pigments by column chromatography

14	Demonstration experiment on HPLC
15	Demonstration experiment on Gas Chromatography

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
5	10	35	50

Name of The Course	MEDICAL SALES REPRESENTATIVE-I			
Course Code	BPMR7007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

1. Personality development and fluent communication to build confidence and developing presentation skills
2. Deliver presentations to doctor, sell and promotion of pharmaceutical products and services as well as everyday connection with different professionals
3. Understand Role of MSR and code of conduct guidelines for MSR.
4. Organizing medical conferences and promotional events as well as Market research and Analysis.

Course Outcomes

CO1	Student will able to Apply the knowledge of basic english grammar and basic of communication for English Speaking and Personality Development.
CO2	Student will able to Apply Public speaking english for everyday communication to sell

	and promote medical products, pharmaceutical products and deliver presentations to doctors.
CO3	Student will able to Apply knowledge to Maintain knowledge of key persons at hospitals, pharmacies and dealers.
CO4	Student will able to learn Distribution system of pharmaceutical products and Organizing medical conferences and promotional events.
CO5	Student will able to Analyze the Therapeutics drug classes and catagories and Core skill professional skills related to organizing medical conferences and promotional events.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
	25	75	100

Course Content:

Unit I: 10 Hours

English Speaking and Personality Development Basics of communication

Introduction to communication
Building Vocabulary.
Sentence construction.
Basic English Grammar
Noun, pronoun, Adjective, Verb, Tenses,
Preposition, Articles, Conjunction, Punctuation.
Grammar usage in sentences.

Unit II: 10 Hours

Public speaking skills

Extempore and Group discussion.
Email drafting, Business correspondence.
Avoiding spelling mistakes and mispronunciations.
Letter writing practice.
Speaking English for the real world

Everyday communication - Introduction, Shopping Meeting friends, Traveling, Visiting a doctor Telephonic communication, Negotiation, At the movie Theatre, at the office, Meeting relatives etc.

Unit III:

10Hours

ORIENTATION MODULE

Maintain knowledge of key persons at hospitals, pharmacies and dealers, gain knowledge about the Overview of Healthcare Ecosystem including relevant Govt. Scheme, social security benefits, ESI, CGHS and Overview about Life Sciences Industry in Indian and Global Context which would enable him/her

Stay informed about health and other relevant standards and the possible company's tie up with various regulatory bodies and authorities, know basic knowledge about Regulatory Authorities and Government Policies, rules and Regulations (CDSCO/NPPA/ MRTP Act) and their impact on business dynamics, relevant to Life Sciences Industry

Understand Role of MSR and code of conduct guidelines for MSR.

Perform the occupations effectively as per company's standard guidelines; gain orientation with Existing Organisation in Life Sciences Industry (in context of Large/Medium/ Small Enterprises): Their Organization Structure, Benefits and typical sales function in a Life Sciences organization and understand the Role of a MSR and required skills and knowledge (As per Qualification Pack) and its Career Path as well as know the MCI Code of Conduct guidelines for MSR and UCP-MP Act

Unit IV 8 Hours

Distribution system of pharmaceutical products.

Maintain knowledge of key persons at hospitals, pharmacies and dealers and to ensure smooth coordination with product distribution related stakeholders; gain the understanding of Distribution System of Pharmaceutical Products and role of various stakeholders involved like CFA, Distributor,

Stockist, and Liasoning Agents.

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Market research and Analysis and RCPA

Monitor competitor's products and selling and promotional activities and gather current market information on pricing, new products, delivery schedules, promoting techniques, etc, know the techniques of Market Research .

Conduct the retail chemist prescription audit effectively and to identify needs of potential customers by going through the prescriptions given by the doctors in the defined geography to their patients, know how to conduct and analyse retail call audits and how to use IT to Capture Market information and also gain the orientation with Physician and Pharmacist needs and working environment

Understanding of human body: Anatomy and physiology

Understand technical/ scientific data presentations and briefings about product and market, know the basics of general Anatomy and general Physiology, and learn various systems of the Human body in tandem with physiology of that organ and system as whole and Familiarise with medical specialities and their common diseases.

Basic of pharmacology

Understand technical/ scientific data presentations and briefings and to understand and interpret clinical data supplied by company, learn fundamentals of pharmacology; understand related terms and their significance and understand basics of Drug metabolism

Overview of drug administration

Understand technical/ scientific data presentations and briefings and to understand and interpret clinical data supplied by company, know what is drug administration, How drug is transported within the Human Body, Mechanism of drug absorption mechanism in the Human body and know Methods of drug administration and various routes of drug administration

Unit V: 7 Hours**Module V****Therapeutics drug classes and categories**

Understand technical/ scientific data presentations and briefings, know about the Therapeutic Drug Classes & Categories and their use in understanding the Product Drug formularies and their relevance for MSR

Understand technical/ scientific data presentations and briefings and to deliver convincing presentations to doctors, pharmacists and other potential customers gain knowledge about Drug Formularies and their relevance for MSR

Orientation on pharmacovigilance

Follow company's legal guidelines and pharmacovigilance process, know that what comprise the field of pharmacovigilance and its related fields, understand its relevance & potential for MSR's role, know common terms used and their reference, understand the scope of Pharmacovigilance as a system, know about National & International pharmacovigilance regulatory Authorities and learn basic processing of a typical pharmacovigilance case" through case studies.

Orientation of disease management

Understand technical/ scientific data presentations and briefings about product and market and to monitor the activities of health services in a specific area, learn the concept of disease management & Its Importance, know about process & factors influencing the disease management processes at gross level, gain knowledge for Disease management for common diseases and various projects being run Nationally and internationally

Organization policy and internal processes at work

Follow the company's guidelines, process and standard gain the orientation with generic Organizational Policy & various internal Process relevant for MSR

Course Code	BPPM7008			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

1. Students will be able to know about fundamentals of production process for API.
2. Students will be able to know about fundamentals of production process for formulations.
3. Students will be able to know about fundamentals of production process for sterile dosage form.

Course Outcomes

After completion of course student shall be able to

CO1	Define the life science industry and sub sectors.
CO2	Demonstrate the fundamentals of pharmaceutical production process.
CO3	Organize the production process for API.
CO4	Analyze the production process for formulations.
CO5	Explain the production process for sterile dosage form.
CO6	Elaborate the advancement in pharmaceutical formulation development.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
	25	75	100

Course Content:

Unit I: Orientation Module	12 Hours
Industry, its sub-sectors <input type="checkbox"/> Know about Regulatory Authorities and Government Policies, rules and Regulations and their impact on manufacturing in Life Sciences Industry in India and Emerging Markets (Both Regulated and	

Name of The Course	Production And Manufacturing I
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Semi Regulated)

- Know about Standards for Manufacturing in Life Sciences like cGMP, ISO, etc. Orientation with Pharmacopeia and how to read them.
- Understand Existing Organization in Life Sciences Industry (in context of Large/Medium/ Small Enterprises): Their Organization Structure and Benefits. Know the typical manufacturing function in a Life Sciences organization.
- Understand the Role of a Production Chemist and required skills and knowledge (As per Qualification Pack) and career path.

Unit II: Fundamentals of Pharmaceutical Production 12 Hours

Know about Basics of Pharmaceutical Science inclusive of Organic Nomenclature System, Organic Reaction Mechanism, and Basic Chemistry fundamentals

- Know about Quality Management System for Production in Life Sciences Industry including its introduction and importance, QC and QA Systems, Productivity norms and calculate the overall equipment efficiency (OEE)
- Know the Techniques of improving productivity (Lean and 6 sigma), and Techniques to control the rejects, Quality by Design. Know and apply the techniques to control and predict the breakdown, Handle the market complaints.
- Know and follow Deviation ,incident and change control procedure and Required Documentation practices by QMS, and implement these at shop floor
- Learn and apply the concepts and practical skills of Quality Risk Management and Data Integrity aligned to cGMP in the context of Indian Culture.
- Learn and follow the documentation practices required by cGMP and implement these learnings at shop floor

Unit III: Production Process for API 12 Hours

Know and apply the Fundamental Science in API Production including Size Separation, Mixing and homogenization Process, Mass Transfer, Fluid Flow, Heat Transfer, Size Reduction, Role of API in typical Pharmaceutical Manufacturing and role of API particle size in formulations

- Know in detail and follow Production Process of API with an in depth understanding and practical

skills on following:

- (1) Unit processes: Oxidation, Reduction, Hydrogenation, Sulfonation, Nitration, and Halogenation.
- (2) Bulk organic chemicals as building blocks for manufacture of drugs and drug intermediates
- (3) Catalysis and Bio catalysis in Industrial production.
- (4) Downstream processes like Filtration, Centrifugation, Extraction, Evaporation, Crystallization, Drying and Size reduction
- (5) Pharmaceutical Manufacturing Equipment's
- (6) Chemical Technologies for selected drugs.

Unit IV: Production Process for Formulations 12Hours

Know in detail about Basics of Formulations including Route of Drug Administration and Various Dosage Forms like Oral Solid Dosage, Liquid Oral Dosage, Sterile Dosage, Dermatological Dosage and their relevant benefits and practice Assay calculation procedure and assay role in formulation, Standard weight procedure or standard quantity effect in formulation

- Learn and apply the conceptual and practical skills about Production process of Oral Solid Dosage including Process of Granulation, Compression, Coating, Capsule Filling

□□ Learn and apply the conceptual and practical skills about Production process of Liquid Oral Dosage covering aspects like:

Types of oral liquids

Types of Monophasic liquid dosage forms

Theoretical aspects of vehicles and additives for Monophasic liquid oral dosage forms

Mixing processes

Filtration : Definition, theory, filter media, selection of the filter media and filter aid

Operation, cleaning and maintenance of filter press

Biphasic dosage forms : Suspensions:

Preparation of suspensions

Types of suspensions

Adjuvants used in suspension, types, selection,

quantity used in formulation

Biphasic dosage forms : Emulsions:

Preparation of Emulsions

Formulation of different types of emulsions

Selection of Emulsifying agents based on HLB values

Machineries required for preparation of Emulsions

In process control parameters for Emulsions

Processing of Liquid Orals Operation, cleaning and maintenance of Filling Lines

Cleaning of manufacturing tanks and validation of cleaning process.

Unit V: Production Process for sterile dosage formulation 12 Hours

To learn the conceptual and practical skills about Production process of Sterile Dosage covering aspects like:

Definition and scope of Aseptic and terminally sterilized processing

Water for injection production, testing and maintenance

Gowning procedures

Good aseptic techniques

Basic microbiology and environmental monitoring

Sterilization techniques and sterilization qualification

Operation and maintenance of autoclave

Liquid Filtration and filter integrity testing

Lyophilisation , Manage SIP and CIP processes

Components preparations

Operation and maintenance of Laminar flow hood

Operation and maintenance of Isolators

Filling of ampoules, vials prefilled syringes, bags

Facility Design and HEPA system

Handle Change Parts- SMED concept

Good documentation practices

Environmental Data trending and excursion analysis

Testing of ampoules and vials for particulate matter.

Equipment handling skills used in the Sterile Dosage production

Unit VI Advancement in Pharmaceutical Formulation Development 8 Hours

• FDA requirement for Investigational New Drug Application

• ICH guidelines for the stability studies of pharmaceutical products

• Role of GMP in pharmaceutical preparation

• Introduction, advantages and limitations of novel drug delivery system

• Introduction and advantages of parenteral drug delivery system

Suggested Reading

Text Book (s):

1. Carter S.J., “Cooper and Gunn’s Tutorial Pharmacy”, CBS Publishers, Delhi.

2. Rawlins E.A., “Bentley’s Text Book of Pharmaceutics”, ELBS Bailliere Tyndall.

3. LachmanL, Liberman H.A and Kanig J.L., “Theory and Practice of Industrial Pharmacy”, Lea and Febiger.

4. Cooper and Gunn’s Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.

Reference Book (s)

1. United States Pharmacopoeia (National Formulary).

2. Remington – “The science and practice of pharmacy” Vol. I & II. Mack Publishing Co., Pennsylvania.

3. Pharmacopoeia of India, The Controller of Publications, Delhi.

4. British Pharmacopoeia, Her Majesty’s Stationary Office, University Press, Cambridge

Other References:

1. Holbein, M.B., 2009. Understanding FDA regulatory requirements for investigational new drug applications for sponsor-investigators. Journal of investigative medicine, 57(6), pp.688-694.

2. ICH guidelines <https://www.ich.org/page/quality-guidelines>.

3. Haleem, R.M., Salem, M.Y., Fatahallah, F.A. and Abdelfattah, L.E., 2015. Quality in the pharmaceutical industry–A literature review. Saudi Pharmaceutical Journal, 23(5), pp.463-469.

4. Patel, K.T. and Chotai, N.P., 2008. Pharmaceutical GMP: past, present, and future—a review. Die Pharmazie–An International Journal of Pharmaceutical Sciences, 63(4), pp.251-255.

5. Shukla, A., Vishnoi, G. and Das, D.R., 2016. Current good manufacturing guidelines for medicinal product. Journal of Drug Delivery and Therapeutics, 6(2), pp.57-61.
6. Bhagwat, R.R. and Vaidhya, I.S., 2013. Novel drug delivery systems: An overview. International Journal of pharmaceutical sciences and research, 4(3), p.970.
7. Banode, S.R., Attar, M.S. and Picche, G., brief review of different types of parenteral devices.
8. <http://www.pharmatips.in/Articles/Pharmaceutics/Parenteral/Advantages-And-Disadvantage-Of-Parenteral-Administered.aspx>.

Name of The Course	Quality assurance			
Course Code	BPQA7009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

- 1. Know the Regulatory Authorities and Government Policies**
- 2. Understand the Production Process & Packaging operation for Life Sciences Industry**
- 3. Understand the Fundamentals of Analytical to Quality Assurance**
- 4. Carryout Process Validation and Exhibit staging for Quality Assurance**

Course Outcomes

CO1	The student will be able to relate the Regulatory Authorities and Government Policies and their impact on manufacturing in Life Sciences Industry.
CO2	The student will be able to categorise the Production Process & Packaging operation of Life Sciences Industry.

CO3	The student will be able to apply the fundamentals of analytical to quality assurance personnel for life sciences industry.
CO4	The student will be able to apply the validation process and exhibit staging for quality assurance.
CO5	The student will be able to conclude the documentation for quality assurance.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
-	25	75	100

Course Content:

Unit I: 14 Hours

Regulatory Authorities and Government Policies
Know about Regulatory Authorities and Government Policies, rules and Regulations and their impact on manufacturing in Life Sciences Industry

- Understand the Standards for Manufacturing in Life Sciences like cGMP, ISO, GLP, GDP etc.

Orientation of Pharmacopeia

- Know about the Existing Organization in Life Sciences Industry (in context of Large/Medium/ Small Enterprises): Their Organization Structure and Benefits. Orientation on typical manufacturing function in a Life Sciences organization.

- Know and Perform the Role of a Quality Assurance Chemist and required skills and knowledge (As per Qualification Pack) and its Career Path

Unit II: 14 Hours

Overview of Production Process & Packaging operation for Life Sciences Industry : Learn and Apply the Fundamental Science in API and Formulation Production, packaging including review skills in PAS/X activities, potency calculation for active materials, procedures and initiate the changes where ever applicable. Co-

ordination for self-inspection audit. Addressing of incidents, investigations, CAPA follow-up and closure. Review and approval of Operational specification, UAT, Master batch records, executed batch report and executed dispensing report in PAS/X. Role of API in typical Pharmaceutical Manufacturing and role of API particle size in formulations, Knowledge on Critical Quality Attributes (CQA), Critical Process Parameters (CPP) and Critical Process Controls(CPC).

Know and apply the Basics of Formulations including Route of Drug Administration and Various Dosage Forms like Oral Solid Dosage, Liquid Oral Dosage, Sterile Dosage, Dermatological Dosage and their relevant benefits, line clearance of various manufacturing and packing operations, routine sampling of in-process and its checks, validation and finished product samples. Collection of stability and control samples during packing operations. Know pack stock checks, batch documents, control on OSD, review and trending of Annual Product Quality Reviews. Gain Knowledge about Quality Management System for Production in Life Sciences Industry including its introduction and importance, QC and QA Systems, Detail aspects of cGMP, GLP, ISO with reference of quality assurance, On the Job Training, material verification, in-process labelling and status of material, release, process validation and stability protocols/reports, with drawl of reserve and stability samples from the production shop floor. Review of SOP, following safety, health and environmental procedures and practices.

Unit III:

14 Hours

Fundamentals of Analytical to Quality Assurance personnel for Life Sciences Industry
 Know and apply the Basics of Pharmaceutical Science and Chemistry inclusive of Organic Nomenclature System, Organic Reaction Mechanism, and Basic Analytical Chemistry fundamentals like including balancing chemical equations, chemical equilibria, acid and base chemistry, stoichiometric calculations, reduction and oxidation chemistry and interaction of light

with matter.

- Gain and apply knowledge of compilation of stability data and its verification, addressing the Quality

impacting and non-impacting incidents, deviations, OOS, OOT, CAPA follow-up and closure, stability protocol certification of commercial and validation batches, ensuring the GMP compliance and control of data integrity issues in QC, analytical reports, knowledge on SAP, verification of standard operating procedures/ standard testing procedures/work sheets/ Analytical report before approval.

- Gain and apply the knowledge of release process of Certificate of analysis for blend, API & finished products, vendor specifications for trending of Out of Trending (OOT) results, notification closures, Quality management systems, stability master data, pulls & maintenance. Knowledge on in-process checks during manufacturing and packing operations.

- Conduct verification of material damage report, review knowledge on Raw material/In-process/Finished products/ Packing materials/ Stability specifications before approval, detail aspects like cGMP, GLP, ISO with reference of quality assurance.

Learn and apply practical skill for Complex and Non-Complex Techniques

Unit IV:

15 Hours

Process Validation and Exhibit staging for Quality Assurance

- Gain and apply the knowledge on hold time data, SHE report availability, compliance in master production records, vendor status of raw material prior to start of new product and before validation batch start, method transfer, method validation and calibration reports.

- Review and approve Master production records, change controls, bill of material, performance qualification protocols and reports, analytical reports related to exhibit/ submission batches, regulatory dossiers of various markets.

- Gain and apply knowledge on R&D development strategy, technology transfer, production and manufacturing assurance for execution of process

performance qualification and verification of batches, Quality impacting and non-impacting incidents, deviations, OOS, OOT, CAPA follow-up and closure, detail aspects like cGMP, GLP compliance.

Unit V: 15Hours

Documentation for Quality Assurance Control, issue, archive and distribute records/ reports/ filing, art works, packing standards, protocols, drug calculations, upload and maintain batch documents in database and SAP, monitor the documents and their controls, control and issue SOP/STP/ Protocols/work sheets/BMR/BPR and record of analysis, design training matrix.

- Prepare, compile and approve annual product quality review as per schedule, evaluate control charts for API, In-process and finished product.

- Conduct incidents, deviations, OOS, OOT, CAPA follow-up and closure, detail aspects like cGMP, Good Documentation Practice compliance.

Name of The Course	Quality Control–I Theory			
Course Code	BPQC7010			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

Upon completion of the course the student shall be able to

1. Understand various regulatory authorities in life science sector
2. Explain the processes involved in the manufacturing of pharmaceuticals
3. Know the dosage forms and the role of quality management system during the manufacturing
4. Understand the quality control processes and the operating knowledge of instruments required.

Course Outcomes

Upon completion of the course, the student shall be able to:

CO1	Define the basic role of quality control chemist.
CO2	Demonstrate the production process of Life science industry
CO3	Identify the fundamentals of Instrumental Analysis of the Life Sciences Industry
CO4	Compare the Operating Knowledge of Analytical Instruments.
CO5	Assess Quality Checks in Quality Control Process.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
0	25	75	100

Course Content:

Unit I: Orientation Module 14 Hours

- Understand Brief outline of Life Sciences Industry, its sub-sectors
- Gain knowledge of Regulatory Authorities and Government Policies, rules and Regulations and their impact on manufacturing in Life Sciences Industry
- Know the Standards for Manufacturing in Life Sciences like CGMP, ISO, GLP, GDP etc. Gain orientation with Pharmacopeia and how to read them
- Know about Existing Organisation in Life Sciences Industry (in context of Large/Medium/ Small Enterprises): Their Organization Structure and Benefits. Orientation on typical manufacturing and Quality function in a Life Sciences organization.
- Know about Role of a Quality Control Chemist and required skills and knowledge (As per Qualification Pack) and its Career Path.

Unit II: Overview of Production Process for Life

Sciences Industry 14 Hours

Know about Fundamental Science in API Production including Size Separation, Mixing and homogenization Process, Mass Transfer, Fluid Flow, Heat Transfer, Size Reduction, Role of API in typical Pharmaceutical Manufacturing and role of API particle size in formulations, Knowledge on Critical Quality Attributes (CQA), Critical Process Parameters (CPP) and Critical Process Controls (CPC).

- Know about Basics of Formulations including Route of Drug Administration and Various Dosage Forms like Oral Solid Dosage, Liquid Oral Dosage, Sterile Dosage, Dermatological Dosage and their relevant benefits, Assay calculation procedure and assay role in formulation, Standard weight procedure or standard quantity effect in formulation.

- Know about Quality Management System for Production in Life Sciences Industry including its introduction and importance, QC and QA Systems, Detail aspects of CGMP, GLP, ISO with reference to quality control Fundamentals of Instrumental Analysis for Life Sciences Industry

Learn and apply Basics of Pharmaceutical Science and Chemistry inclusive of Organic Nomenclature System, Organic Reaction Mechanism, and Basic Analytical Chemistry fundamentals including balancing chemical equations, chemical equilibria, acid and base chemistry, stoichiometric calculations, reduction and oxidation chemistry and interaction of light with matter.

Unit III: Fundamentals of Instrumental Analysis for Life Sciences Industry 14 Hours

Know and apply the detailed understanding of basic principles of Separation Sciences, critical system parameters and their Industrial use in Quality Control analysis for Life Sciences Industry, Sample Preparation, preservation and Storage

Know and apply the basics of Sample Preparation, preservation and storage, Handling Glassware in Laboratory, Calibration of Glassware. Guidelines for

Weighing and measuring the samples, safety precautions while handling sample and understanding the toxicity and carcinogenicity while handling critical samples.

- Know about Standards and guidelines for sample handling in Pharmaceutical and Biopharmaceutical Industry and perform sample handling and preparation.
- Gain detailed knowledge of Good Storage Practice, how to know stability of sample and process of sample stabilization, before storage of sample and apply the learned practices while sample storage.

Unit IV: Operating Knowledge of Analytical Instruments 15 Hours

- Gain detailed knowledge about Molecular, Atomic near Infrared spectroscopy and Vibrational spectroscopy and the analysis of metals and apply learning while operating analytical instruments.

- Gain Conceptual Scientific Knowledge and skills and operate analytical Equipment and Machinery like Fourier Transfer-Infrared (FT-IR), Inductively Coupled Plasma (ICP), Auto-Titration, UV-Visible, mass spectrophotometer detector, pH meter.

- Gain knowledge and skills about Chromatography including Basic principles of chromatography, Thin Layer Chromatography, Gas Chromatography and Liquid Chromatography, High performance Liquid Chromatography, Preparatory, High performance Liquid Chromatography.

- Operate analytical Equipment and Instruments like Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC).

Unit V: Perform Quality Checks in Quality Control Process 15 Hours

Learn and Perform Quality Check (Inspection and Analysis) in QC, compare results with statistical limits, Calibrations, IQ, OQ, PQ and techniques for improving instrumental analysis. Handle Exceptions. Operate the instruments like stability chambers, BOD incubators and Photofluorometer. Knowledge of QC analysis

Checklist for all relative instruments.

- Know about and Productivity norms and calculate the overall equipment efficiency (OEE), practice Techniques of improving productivity (Lean and 6 sigma), Techniques to control the rejects. Learn and apply Techniques to control the breakdown, Handling of market complaints, Deviation, incident and change control procedure and Required Documentation practices by QMS, CGMP.
- Carry out Statistical Analysis of Laboratory data: Gain Knowledge of Calculations and Use of QC Statistics like Levey-Jennings Charts & Westgard Rules, CV, Comparative Evaluations, CVR, SDI.
- Learn and apply Fundamentals of Advance QC approaches like Quality by Design and Process Analytical Technology, Method Transfer Process and how to manage the Quality Risk.
- Practice Practical problem solving/ trouble shooting in QC Analysis.

Suggested Reading

1. Textbook of Quality control chemist, LSSSDC
2. Remington: The Science and Practice of Pharmacy.

Name of The Course	MEDICAL SALES REPRESENTATIVE- I			
Course Code	BPMR7011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Upon completion of the subject student shall be able to understand;

1. Personality development and fluent communication
2. To develop conversation techniques to influence the potential customers.
3. Understanding of Distribution System of Pharmaceutical Products.
4. To become more effective in meetings, in making presentations and in their use of informal English

Course Outcomes

CO1	Apply communication skill, group tasking,
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to become more effective in meetings, and making presentations

CO2 Analyze a strong cross-cultural element, giving participants an ideal opportunity to see issues from an entirely new perspective

Text Book (s):

1. Mastering the Complex Sale Second Edition by Jeff Thull.
2. How to Master the Art of Selling by Tommy Hopkins
3. How to Win Friends and Influence People by Dale Carnegie.

Reference Book (s)

1. **Secrets of Closing the Sale by ZigZiglar.**
2. Smart Guide to Becoming a Medical Sales Representative (English, Paperback, Penny Dhanjal)
3. How to Master the Art of Selling by Tommy Hopkins.

List of Experiments	
1	Discussion, brainstorming and debates. Group work and tasks
2	Communication exercises and Reading and listening comprehension.
3	Communication exercises and Reading and listening comprehension.
4	Vocabulary and written exercises and Role playing
5	Selected grammar where required and Conversation techniques.
6	Company visit and/or guest speaker and Individual and group presentations
7	Introduction to Personality Development and Interview skills
8	Introduction to hospitals, pharmacies and dealers and Understanding of Distribution System of Pharmaceutical Products.
9	Role of various stakeholders involved like CFA, Distributor, Stockist, and Liasoning Agents and Introduction to products and

	selling and promotional activities.
10	19. Introduction to Conduct the retail chemist prescription audit (RCPA) and Introduction to basics of general Anatomy and general Physiology.
11	Introduction to various systems of the Human body in tandem with physiology of that organ and system and Introduction to scientific data presentations and briefings.
12	Introduction to fundamentals of pharmacology.
13	Introduction to various routes of drug administration and drug absorption.
14	Introduction to Therapeutics drug classes and categories.
15	Introduction to pharmacovigilance.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test (ETE)	Total Marks
	15	35	50

Name of The Course	Production and Manufacturing-I (Practical)			
Course Code	BPPM7012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Upon completion of the subject student shall be able to understand;

1. Develop skills and knowledge of production chemist.

2. Understand the professional way of handling various equipment required at production shop floor.
3. Develop skills required for troubleshooting

Course Outcomes

CO1	Students will be able to gain knowledge about various regulatory agency working for pharmaceutical industry.
CO2	Students will be able to prepare SOP
CO3	Students will be able to develop knowledge about GMP, GLP and cGMP

Text Book (s):

1. Carter S.J., "Cooper and Gunn's Tutorial Pharmacy", CBS Publishers, Delhi.
2. Rawlins E.A., "Bentley's Text Book of Pharmaceutics", ELBS Bailliere Tyndall.
3. Lachman L., Liberman H.A and Kanig J.L., "Theory and Practice of Industrial Pharmacy", Lea and Febiger.
4. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.

Reference Book (s)

1. Aulton, M.E, Text Book of Pharmaceutics, Vol., I & II. Churchill Livingstone.
2. United States Pharmacopoeia (National Formulary).
3. Remington – "The science and practice of pharmacy" Vol. I & II. Mack Publishing Co., Pennsylvania.

List of Experiments	
1	To study about various regulatory authorities governing Pharmaceutical industry.
2	To study about the GMP, GLP and cGMP.
3	To study about the required skills and

	knowledge of production chemist.
4	To study the importance of production department in Pharmaceutical industry.
5	To study the various technique to improve productivity in Pharmaceutical Industry.
6	To study the process of breakdown and handling during manufacturing process.
7	To study the fundamentals science in size separation and size reduction.
8	To study the working of ball mill
9	To study the effect of surface area on the rate of evaporation.
10	To study the effect of temperature on the rate of evaporation.
11	To study the basics of various route of administration.
12	To prepare solid oral tablet dosage form.
13	To prepare liquid oral suspension
14	To study granulation technique to prepare tablet dosage form.
15	To study the working of friabilator.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test (ETE)	Total Marks
	15	35	50

Name of The Course	Quality Assurance-I Practical				
Course Code	BPQA7013				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	0	0	4	2	

Course Objectives:

Course Outcomes

CO1	The student will be able to apply the basics of
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	quality assurance to evaluate the various dosage form.
CO2	The student will be able to classify the GMP and GLP guidelines.
CO3	The student will be able to perform calibration of various equipment.
CO4	The student will be able to apply the concept of validation reports.

Text Book (s):

1. Quality Planning and Analysis / Edition 3 by J. M. Juran, Frank M.
2. An Introduction to Quality Assurance in Health Care by M Perides

Reference Book (s)

1. Remington's Pharmaceutical Sciences.
2. Pharmacopoeia of India, The Controller of Publications, Delhi.
3. United States Pharmacopoeia (National Formulary).

List of Experiments	
1	To study the fundamental science in API formulation production.
2	To study about hardness tester.
3	To observe coating machine
4	To perform pharmacopoeia assay of D.T apparatus
5	To study the capsule the capsule filling machine
6	To study the autoclave
7	To study the calibration report of pharmaceutical method
8	To study different sample labels
9	To study the validation reports
10	To study about pharmacological assay of different doses forms
11	To prepare BMR.
12	To study about sample validation reports
13	To study particle size analyzer
14	To study GMP and GLP guidelines
15	To study hardness tester

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test (ETE)	Total Marks
	15	35	50

Name of The Course	Quality Control-Practical			
Course Code	BPQC7014			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

The main purpose of subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the pharmaceutical industry. It helps in the understanding of the role of quality control chemist in the coordination of an organization.

Course Outcomes

CO1	The student will be able to perform the Quantitative test for the analysis of the drug.
CO2	The student will be able to perform the Qualitative tests of the given drug.
CO3	The student will be able to execute the demo process with the GMP (Good Manufacturing Practices) and GLP (Good Laboratory Practices).

Text Book (s):

1. Textbook of Quality control chemist, LSSDC
2. Remington: The Science and Practice of Pharmacy

List of Experiments	
1	To Study the importance of GLP
2	To study the essential parameters of QC chemist
3	To study the Importance of API for the efficient functioning of any industry .
4	To Determine the effect of Self Inspection and Quality control..
5	To determine the purity of marketed drug through UV.
6	To determine the purity of marketed drug through IR.
7	To study the Importance safety of the workers for good organisation.
8	To prepare and check 50 ml chloroform water IP 1966.
9	To prepare and check 20 ml of aqueous iodine solution IP.
10	To prepare and check 20 g of simple syrup IP.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test (ETE)	Total Marks
	15	35	50

Name of The Course	BIOSTATISTICS AND RESEARCH METHODOLOGY			
Course Code	BPHT8001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	4

Course Objectives

Upon completion of the course, the student shall be able to:

- Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.

Course Outcomes

CO1	Students will be able to apply the concept correlation, dispersion and frequency distribution to the given data.
CO2	Students will be able to apply the parametric tests, probability formulae and they will also be able to calculate regression.
CO3	Students will be able to apply the non parametric tests, design research methodology and to make graph
CO4	Students will be able to apply the concept of regression modeling and to understand practical components of industrial and clinical trials problems.
CO5	Students will be able to analyze and design experiments.
CO6	Students will be able to explore to create trend/innovation for different novel research methodology and to learn futuristic biostatistics problem.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1: 10 Hours
Statistics, Biostatistics, Frequency distribution Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples Measures of

dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

Unit-2 10 hours

Regression: Curve fitting by the method of least squares, fitting the lines $y=a+bx$ and $x=a+by$, Multiple regression, standard error of regression- Pharmaceutical Examples Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties – problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples Parametric test: t-test (Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

Unit-3 12 hours

Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plotgraph Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Unit-4 08 hours

Blocking and confounding system for Two-level factorials

Regression modeling: Hypothesis testing in Simple and Multiple regression models Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R- Online

Statistical Software's to Industrial and Clinical trial approach	
Unit-5	07
hours	
Design and Analysis of experiments: Factorial Design: Definition, 2^2 , 2^3 design. Advantage of factorial design Response Surface methodology: Central composite design, Historical design, Optimization Techniques	
Unit-6	8
hours	
Recent advancement in Research Methodology and Biostatistics: Innovative trend analysis methodology, The quantity synthesis of single subject research: Methodology and validation, The future of biostatistics: expecting the unexpected.	

Suggested Readings:

Text Books

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. New York.
2. Fundamental of Statistics– Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,

Reference Books

1. Design and Analysis of Experiments– Wile Students Edition, Douglasand C. Montgomery

Name of The Course	SOCIAL AND PREVENTIVE PHARMACY			
Course Code	BPHT8002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

After the successful completion of this course, the student shall be able to: Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the

country and worldwide. Have a critical way of thinking based on current healthcare development. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

Course Outcomes

CO1	The student will be able to understand the concept of prevention and control of disease, social causes of diseases, sociology and health of the ill person
CO2	The student will be able to apply the concept of preventive medicine
CO3	The student will be able to identify and explore the awareness of preventive medicine with the help of objectives scheduled and functioning of National health programme of many diseases i.e., TB, leprosy etc
CO4	The student will be able to interpret and analyze the different health intervention program and analyze the role of WHO in Indian national program for preventive medicine
CO5	The student will be able to relate the functioning of national urban health mission and health promotion and education in school
CO6	The student will be able to create healthy community

Text Books

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications

Reference Books

1. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
2. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

MODULE-I 10 Hours
Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention. Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health Hygiene and health: personal hygiene and healthcare; avoidable habits
MODULE-II 10 hours
Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse
MODULE-III 10 Hours
National health programs, its objectives, functioning and out come of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National eprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.
MODULE-IV 08 Hours
National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National

Malaria Prevention Program, National programme for the healthcare for the elderly, Social health programme; role of WHO in Indian national program.

Module-5 07 Hours

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	PHARMA MARKETING MANAGEMENT (Theory)			
Course Code	BPHT8003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

Course Outcomes

CO1	The student will be able to relate the basic concept of pharmaceutical marketing.
CO2	The student will be able to analyze the requirements for product design.
CO3	The student will be able to apply the concept of promotion for pharmaceutical products
CO4	The student will be able to identify the marketing channels and understand the role of professional sales representative.
CO5	The student will be able to apply the concepts of drug pricing as per Drug Price Control Order.

Text Books

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.

Reference Books

1. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
2. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) ExcelPublications.

MODULE-I	10 Hours
Marketing	
Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.	
Pharmaceutical Marketing	
Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting.Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist.Analyzing the Market;Role of market research.	
MODULE-II	10 hours
Product Decision	
Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.	
MODULE-III	10 Hours
Promotion	

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

MODULE-IV 08 Hours

Pharmaceutical marketing channels:

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

Module-5 07 Hours

Pricing:

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order)and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing:

Vertical & Horizontal Marketing; RuralMarketing; Consumerism; Industrial Marketing; Global Marketing.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	PHARMACEUTICAL REGULATORY SCIENCE (Theory)			
Course Code	BPHT8004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C

3 | 1 | 0 | 4

Course Objectives:

Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

Course Outcomes

CO1	The student will be able to relate the basic concept of drug development process.
CO2	The student will be able to identify the regulatory bodies for the approval of new drugs/products.
CO3	The student will be able to understand the process of registration of Indian drug product in overseas market.
CO4	The student will be able to apply the basic concepts of clinical trials.
CO5	The student will be able to analyze the regulatory requirements in pharmaceutical industry.

Text Books

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics / edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143

Reference Books

1. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance
By Fay A. Rozovsky and Rodney K. Adams
2. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
3. Drugs: From Discovery to Approval, Second Edition By Rick Ng

MODULE-I	10 Hours
New Drug Discovery and development Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.	
MODULE-II	10 hours
Regulatory Approval Process Approval processes and time lines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA /ANDA.	
Regulatory authorities and agencies Over view of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	
MODULE-III	10 Hours
Registration of Indian drug product in overseas market Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.	
MODULE-IV	08 Hours
Clinical trials Developing clinical trial protocols, Institutional Review Board/Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance-safety monitoring in clinical trials	

Module-5 07 Hours
Regulatory Concepts Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	PHARMACOVIGILANCE (Theory)			
Course Code	BPHT8005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

At completion of this paper it is expected that students will be able to (know, do, and appreciate):

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during preclinical, clinical and postapproval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning

12. CIOMS requirements for ADR reporting

13. Writing case narratives of adverse events and their quality.

Course Outcomes

CO1	Student will be able to learn about development of pharmacovigilance as a science and monitor adverse drug reactions
CO2	Students will be able to evaluate adverse reactions, will have understanding of drugs and diseases
CO3	Students will be able to assess casualty, signal detection, role of drug safety in the successful development and usage of medicine to the benefit of patients
CO4	Students will be able to evaluate good clinical practice in pharmacovigilance studies and understand the concept of pharmacovigilance system in India and its regulation
CO5	Student will be able to understand global scenario of Pharmacovigilance and train students

Text Books

1. Textbook of Pharmacovigilance: SK Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers.

Reference Books

1. Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
2. A Textbook of Clinical Pharmacy Practice-Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata
3. National Formulary of India

MODULE-I 10 Hours	
Introduction to Pharmacovigilance History and development of Pharmacovigilance Importance of safety monitoring of Medicine WHO international drug monitoring programme Pharmacovigilance Program of India(PvPI) Introduction to adverse drug reactions Definitions and classification of ADRs Detection and reporting Methods in Causality assessment Severity and seriousness assessment Predictability and preventability assessment Management of adverse drug reactions Basic terminologies used in pharmacovigilance Terminologies of adverse medication related events Regulatory terminologies	
MODULE -II 10 hours	-II
Drug and disease classification Anatomical, therapeutic and chemical classification of drugs International classification of diseases Daily defined doses International Non proprietary Names for drugs Drug dictionaries and coding in pharmacovigilance WHO adverse reaction terminologies MedDRA and Standardised MedDRA queries WHO drug dictionary Eudravigilance medicinal product dictionary Information resources in pharmacovigilance Basic drug information resources Specialised resources for ADRs Establishing pharmacovigilance programme Establishing in a hospital Establishment & operation of drug safety department in industry Contract Research Organisations (CROs) Establishing a national programme	
MODULE-III 10 Hours	
Vaccine safety surveillance Vaccine Pharmacovigilance	

Vaccination failure Adverse events following immunization Pharmacovigilance methods Passive surveillance – Spontaneous reports and case series Stimulated reporting Active surveillance – Sentinel sites, drug event monitoring and registries Comparative observational studies – Cross sectional study, case control study and cohort study Targeted clinical investigations Communication in pharmacovigilance Effective communication in Pharmacovigilance Communication in Drug Safety Crisis management Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media	
MODULE -IV 08 Hours	-IV
Safety data generation Preclinical phase Clinical phase Post approval phase (PMS) ICH Guidelines for Pharmacovigilance Organization and objectives of ICH Expedited reporting Individual case safety reports Periodic safety update reports Post approval expedited reporting Pharmacovigilance planning Good clinical practice in pharmacovigilance studies	
Module-5 07 Hours	
Pharmacogenomics of adverse drug reactions Genetics related ADR with example focusing PK parameters. Drug safety evaluation in special population Paediatrics Pregnancy and lactation Geriatrics CIOMS CIOMS Working Groups CIOMS Form CDSO (India) and Pharmacovigilance D&C Act and Schedule Y	

Differences in Indian and global pharmacovigilance requirements

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)			
Course Code	BPHT8006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the subject student shall be able to;

1. Know WHO guidelines for quality control of herbal drugs
2. Know Quality assurance in herbal drug industry
3. Know the regulatory approval process and their registration in Indian and international markets
4. Appreciate EU and ICH guidelines for quality control of herbal drugs

Course Outcomes

CO1	The student will be able to utilize the basic knowledge of standardization of plant material as per WHO guidelines.
CO2	The student will be able to apply the analysis of official formulations derived from crude drugs as per cGMP, GAP and GLP in traditional system of medicines.
CO3	The student will be able to apply the basic concept of safety and efficacy of herbal crude drugs as per ICH guidelines.

CO4	The student will be able to apply the knowledge of documentation of stability testing and analysis of the active plant constituents as per GMP requirements.
CO5	The student will be able to explain and utilize the knowledge of chemical and biological markers in safety monitoring of herbal products as per WHO guidelines.

Text Books

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I, Carrier Pub, 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.

Reference Books

1. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
2. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
3. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.

4. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

MODULE-I 10 Hours
Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use
MODULE –II 10 hours
Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants.
MODULE-III 10 Hours
EU and ICH guidelines for quality control of herbal drugs. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines
MODULE –IV 08 Hours
Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration. GMP requirements and Drugs & Cosmetics Act provisions.
Module-5 07 Hours
Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products.

Continuous Assessment Pattern

Internal Assessment	Sessional Exam	End Term	Total Marks
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(IA)		Test (ETE)	
10	15	75	100

Name of The Course	COMPUTER AIDED DRUG DESIGN (Theory)			
Course Code	BPHT8007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the course, the student shall be able to understand

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
The design of new drug molecules using molecular modeling software

Course Outcomes

The student will be able to illustrate about lead discovery and analog based drug design.
The student will be able to illustrate about structure activity relationship (SAR), quantitative structure activity relationship (QSAR) and 3D quantitative structure activity relationship (3D QSAR).
The student will be able to illustrate about molecular docking and virtual screening techniques .
The student will be able to illustrate about Informatics and methods in drug design.
The student will be able to illustrate about molecular mechanics and quantum mechanics.

Text Books

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Park Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvold's Text Book of Organic

Medicinal & Pharmaceutical Chemistry” Lippincott, New York.

4. Foye WO “Principles of Medicinal chemistry ‘Lea &Febiger.

5. Korolkovas A, Burckhalter JH. “Essentials of Medicinal Chemistry” Wiley Interscience.

6. Wolf ME, ed “The Basis of Medicinal Chemistry, Burger’s Medicinal Chemistry”

John Wiley & Sons, New York.

6. Cobert’s Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers.

Reference Books

1. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.

2. Smith HJ, Williams H, eds, “Introduction to the principles of Drug Design” Wright Boston.

3. Silverman R.B. “The organic Chemistry of Drug Design and Drug Action” Academic Press New York.

MODULE-I

10 Hours

Introduction to Drug Discovery andDevelopment

Stages of drugdiscoveryand development

Lead discovery and AnalogBased Drug Design

Rational approaches to lead discoverybased on traditional medicine, Randomscreening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

MODULE

-II

10 hours

Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet’s substituent constant

and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

MODULE-III

10 Hours

Molecular Modeling and virtual screening techniques

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

MODULE

-IV

08 Hours

Informatics &Methods indrug design

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

Module-5 07 Hours

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	CELL AND MOLECULAR BIOLOGY (Elective subject)			
Course Code	BPHT8008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the subject student shall be able to;

- Summarize cell and molecular biology history.

- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

Course Outcomes

CO1	Cell biology is a branch of biology that studies cells – their physiological properties,
CO2	their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
CO3	This is done both on a microscopic and molecular level.
CO4	Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.

Text Book (s)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.

Reference Book (s)

1. Rose: Industrial Microbiology.
2. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
3. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
4. Pepler: Microbial Technology.
5. Edward: Fundamentals of Microbiology.
6. . N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
7. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

8. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
9. Applications of Recombinant DNA: ASM Press Washington D.C.
10. RA Goldshy et. al., : Kuby Immunology.

Unit-1

10 hours

- a) Cell and Molecular Biology: Definitions theory and basics and Applications.
- b) Cell and Molecular Biology: History and Summation.
- c) Properties of cells and cell membrane.
- d) Prokaryotic versus Eukaryotic
- e) Cellular Reproduction
- f) Chemical Foundations – an Introduction and Reactions (Types)

Unit-2

10 Hours

- a) DNA and the Flow of Molecular Information
- b) DNA Functioning
- c) DNA and RNA
- d) Types of RNA
- e) Transcription and Translation

Unit-3

10 Hours

- a) Proteins: Defined and Amino Acids
- b) Protein Structure
- c) Regularities in Protein Pathways
- d) Cellular Processes
- e) Positive Control and significance of Protein

Unit-4

8 Hours

- a) Science of Genetics
- b) Transgenics and Genomic Analysis
- c) Cell Cycle analysis
- d) Mitosis and Meiosis
- e) Cellular Activities and Checkpoints

Unit-5

7 Hours

- a) Cell Signals: Introduction
- b) Receptors for Cell Signals
- c) Signaling Pathways: Overview
- d) Misregulation of Signaling Pathways
- e) Protein-Kinases: Functioning

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	COSMETIC SCIENCE(Theory)			
Course Code	BPHT8009			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

The basic objective of this course is to get familiar with cosmetic science.

Course Outcomes

CO1	The student will able to plan and employ the concept of cosmetic formulation and building blocks of skin care products
CO2	The student will able to apply the concept of preventive medicine
CO3	The student will able to apply the knowledge of herbs in the formulation of herbal cosmetics
CO4	The Student will able to evaluate the different cosmetic products
CO5	The students will able to apply the knowledge of cosmetic problem associated with different cosmetic products

Text Book (s)

- 1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
- 2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.

Reference Book (s)

- 1) Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

Unit-1 10 hours

Classification of cosmetic and cosmeceutical products
 Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs
Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives.
 Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums

Unit-2

10 Hours

Principles of formulation and building blocks of skin care products:

Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.

Antiperspant & deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products:

Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils.

Chemistry and formulation of Para-phenylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

Unit-3

10 Hours

Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics: Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin- cream and toothpaste.

Unit-4

8 Hours

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL,

Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.
Unit-5 7 Hours
Oily and dry skin, causes leading to dry skin, skin moisturization. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	EXPERIMENTAL PHARMACOLOGY			
Course Code	BPHT8010			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the course the student shall be able to,

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in preclinical research
- Appreciate and demonstrate the importance of biostatistics and research methodology
- Design and execute a research hypothesis independently

Course Outcomes

CO1	Analyze CPCSEA and OECD guidelines for
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	maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals.
CO2	Analyze the pre clinical studies for CNS activity as well as learn about research methodologies.
CO3	Analyze the pre clinical studies for ANS activity on lab animals.
CO4	Analyze the pre clinical studies for CVS activity on lab animals.
CO5	To analyze pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA.

Text Book (s)

1. Fundamentals of experimental Pharmacology- by M.N. Ghosh
2. Hand book of Experimental Pharmacology-
3. CPCSEA guidelines for laboratory animal
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh
6. Introduction to biostatistics and research
Richard

Unit-1 10 hours

Laboratory Animals:

Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

Unit-2 10 Hours

- a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.
- b. Study of screening animal models for

Diuretics, nootropics, anti-Parkinson's, antiasthmatics, Preclinical screening models: for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease
Unit-3 10 Hours
Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics.
Unit-4 8 Hours
Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslipidemic, anti aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.
Unit-5 7 Hours
Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA. Graphical representation of data

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	ADVANCED INSTRUMENTATION TECHNIQUES
Course Code	BPHT8011

Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the course the student shall be able to

- understand the advanced instruments used and its applications in drug analysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

Course Outcomes

CO1	Students will be able to interpret the NMR & Mass Spectra.
CO2	Students will be able to analyze the samples thermal methods of analysis & X-ray diffraction methods.
CO3	Students will be able to apply the concept of calibration and validation.
CO4	Students will be able to apply the radioimmunoassay and extraction techniques.
CO5	Students will be able to analyze the compounds through hyphenated techniques like LC-MS/MS, GC-MS/MS and HPTLC-MS.

Text Book (s)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.

Reference Book (s)

1. Instrumental Methods of Chemical Analysis by B.K Sharma

2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I.L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

Unit-1
10 hours

Nuclear Magnetic Resonance spectroscopy
Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin-spin coupling, relaxation, instrumentation and applications

Mass Spectrometry-Principles, Fragmentation, Ionization techniques- Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

Unit-2
10 Hours

Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

Unit-3
10 Hours

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments

Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC

Unit-4
8 Hours

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immunoassay

Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

Unit-5
7 Hours

Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Mode of Evaluation: The theory and lab performance of students are evaluated separately

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	DIETARY SUPPLEMENTS AND NUTRACEUTICALS			
Course Code	BPHT8012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to :

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Appreciate the components in dietary supplements and the application.
4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

Course Outcomes

CO1 | Students will be able to understand the need of

	supplements by the different group of people to maintain healthy life.
CO2	Students will be able to develop a high level understanding of occurrence, chemical nature and medicinal benefits a phytochemicals as nutraceuticals.
CO3	Students will be able to analyze the introduction, basic mechanism of free radicals and need of dietary fibres and complex carbohydrates.
CO4	Students will be able to analyze the role of free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer and Atherosclerosis and basic mechanism of natural and synthetic antioxidants.
CO5	Students will be able to understand the need of regulatory aspects; FSSAI, FDA, FPO, MPO, AGMARK, HACCP and GMPs on Food safety and Pharmacopoeial specifications for dietary supplements and nutraceuticals.

Text Book (s)

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K. T. Agusti and P. Faizal: BSP Publication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F. Balch and Phyllis A. Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C. Williams Editors 2000 *Functional foods* Woodhead Publ. Co. London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 *Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in Essential of Functional Foods* M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)

10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease* e. Eighth edition. Lea and Febiger

Unit-1

10 hours

- a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.
- b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.
- c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

Unit-2

10 Hours

- Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following
- a) Carotenoids- α and β -Carotene, Lycopene, Xanthophylls, leutin
 - b) Sulfides: Diallyl sulfides, Allyl trisulfide.
 - c) Polyphenolics: Resveratrol
 - d) Flavonoids- Rutin, Naringin, Quercetin, Anthocyanidins, catechins, Flavones
 - e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
 - f) Phytoestrogens : Isoflavones, daidzein, Geobustin, lignans
 - g) Tocopherols
 - h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, seafoods, coffee, tea and the like.

Unit-3

10 Hours

- a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.
- b) Dietary fibres and complex carbohydrates as functional food

ingredients.
Unit-3 8 Hours
a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscledamage. Free radicals involvement in other disorders. Free radical theory of ageing. b) Antioxidants: Endogenous antioxidants—enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α -Lipoic acid, melatonin Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxyl Anisole. c) Functional foods for chronic disease prevention
Unit-5 7 Hours
a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals. b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods. c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	Pharmaceutical product development			
Course Code	BPET8013			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	1	0	4

Course Objectives:

Upon completion of the course student shall be able

1. To understand various approaches for development of pharmaceutical product.
2. To understand the criteria for selection of drugs and excipient for the development of their formulation and evaluation

Course Outcomes

CO1	Students will be able to understand the objectives, introduction to pharmaceutical product development and quality control testing of different types of dosage forms.
CO2	Students will be able to develop a high level understanding of advanced study of pharmaceutical excipients in pharmaceutical product development with a special reference
CO3	Students will be able to analyze the selection and application of excipients in pharmaceutical formulations with specific industrial applications.
CO4	Students will be able to analyze the optimization techniques in pharmaceutical product development.
CO5	Students will be able to understand the selection and quality control testing of packaging materials for pharmaceutical product development and regulatory consideration.

Text Book (s)

1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, Charles Bon; Marcel Dekker Inc.
2. Encyclopedia of Pharmaceutical Technology, edited by James Swarbrick, Third Edition, Informa Healthcare publishers.
3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman and Leon Lachman; Marcel Dekker, Inc.
4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by R. P. Khar, S. P. Vyas, Farhan J. Ahmad, Gaurav K. Jain; CBS Publishers and Distributors Pvt. Ltd. 2013.
5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by

Patrick J. Sinko, BI Publications Pvt. Ltd.

6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and

R. K.Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.

7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B.Popovich, Howard C. Ansel, 9th Ed. 40

8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton,3rd Ed.

9. Remington – The Science and Practice of Pharmacy, 20th Ed.

10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman and Joseph B. Schwartz

11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker.

12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis and H.A. Libermann.

13. Advanced Review Articles related to the topics.

Unit-1 10 hours
Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms
Unit-2 10 Hours
An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories i. Solvents and solubilizers ii. Cyclodextrins and their applications iii. Non - ionic surfactants and their applications iv. Polyethylene glycols and sorbitols v. Suspending and emulsifying agents vi. Semi solid excipients
Unit-3

10 Hours
An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories i. Tablet and capsule excipients ii. Directly compressible vehicles iii. Coat materials iv. Excipients in parenteral and aerosols products v. Excipients for formulation of NDDS Selection and application of excipients in pharmaceutical formulations with specific industrial applications
Unit-4 8 Hours
Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.
Unit-5 7 Hours
Selection and quality control testing of packaging materials for pharmaceutical product development-regulatory consideration

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
10	15	75	100

Name of The Course	Project Work				
Course Code	BPPW8012				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
				12	6

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test	Total Marks

		(ETE)	
		150	150

Name of The Course	MEDICAL SALES REPRESENTATIVE-II			
Course Code	BPMR8014			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives:

This subject involves analysis of overall personality development, better communication, marketing research, public relation, professional relation with medical companies, hospitals to conduct smooth work flow by a MSR.

Course Outcomes

CO1	Student will able to Apply the knowledge for Personality Development.
CO2	Student will able to Apply knowledge to Orientation with presales activities.
CO3	Student will able to Apply Core skills and professional skills related to promoting and selling pharmaceutical products to potential customers and for providing after sales service.
CO4	Student will able to Apply knowledge to Organizing medical conferences and promotional events
CO5	Student will able to Analyze the Core skill professional skills related to organizing medical conferences and promotional events.

Text Book (s)

Mastering the Complex Sale Second Edition by Jeff Thull.

How to Master the Art of Selling by Tommy Hopkins.

How to Win Friends and Influence People by Dale Carnegie.

Secrets of Closing the Sale by Zig Ziglar.

Reference Book (s)

Smart Guide to Becoming a Medical Sales Representative (English, Paperback, Penny Dhanjal)

How to Master the Art of Selling by Tommy Hopkins.

Unit-1

20 hours

Personality Development.

- Manners & Etiquettes.
- Building confidence and developing presentation skills.

- Dress code and color pattern.

Interview skills

Resume writing.

- Interview question and answers.

- Mock sessions.

Core skills and professional skills related to gathering information about product and competitor

To effectively gather information about the product and competitors know the required skill set and learn application of related Core Skills and Professional Skills like Reading, writing, listening and speaking, Critical thinking, problem solving, decision making, customer centricity, plan and organizing, Analytical thinking

Pharmaceutical marketing

To develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector; understand Role of Marketing across Product lifecycle; gain knowledge about trends in Pharmaceutical Marketing and implications of changing marketplace on promotional activities in Pharma and gain knowledge about Patient-Physician relationship and Physician-MSR relationship.

Unit-2

20 hours

Orientation with presales activities

To sell and promote medical products and services and to arrange appointments with medical professionals gain orientation with Pre-Sales Activity in reference to Communication strategies for products

To deliver presentations to doctors, pharmacists and other potential customers, learn basics of effective business communication and learn how to conduct effective business meetings

Sales in life sciences

To sell and promote medical and pharmaceutical products and services learn basics of Selling Process.

To develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector understand different Sales

Approaches in Pharma

To engage the potential customers using various methods, tolls and approaches to convince him/her to prescribe your products learn how to effectively handle Objections, basics of Emotional Quotient (EQ)

Unit-3**12 hours**

To ensure the target orientation to reach sales and collection targets learn the process and importance of daily reporting for MSR

To follow company's legal guidelines and pharmacovigilance process while selling products and providing after-sales service, including channeling queries through the company defined process understand

To deliver presentations to doctors, pharmacists and other potential customers , learn basics of effective business communication and learn how to conduct effective business meetings

Core skills and professional skills related to promoting and selling pharmaceutical products to potential customers and for providing after sales service

To promote and sell Pharmaceutical Products to potential customers and for providing after sales service, know the required skill set and learn the application of Core Skills and Professional Skills like Reading, writing, listening, speaking, Plan and organize, Critical thinking, problem solving, decision making, customer centricity and their application at workplace

Unit-4**10 hours**

Organizing medical conferences and promotional events

To establish contact with maximum people within and outside the company to gather inputs on arranging the conference/ promotional event (CMEs) learn techniques for Collaborating with Other Groups and Divisions, understand the importance of collaboration

for MSR

To gain and spread knowledge from the event related to business/ brand/ company learn how to Identify Partnering Opportunities during meetings/ seminars

To manage arrangements within the approved budget learn how to achieve Resource Optimisation at work

To cover all important aspects related to the topic of the conference in the agenda/ theme of promotional event and to plan and complete all logistical arrangements to execution learn the application of Planning & Organizing Skills at work and learn how to effectively use Information Technology in organising conferences and events (CMEs).

Unit-5**20 hours**

Core skill professional skills related to organizing medical conferences and promotional events

Organize Medical Conferences and promotional events (CMEs), by applying Core Skills and Professional Skills like Reading, writing, listening, speaking Analytical thinking, problem solving, decision making, customer centricity.

Information technology skills

Compile and analyse the reports and deliver presentations using Basic Computer operating Skills like Ms Office (Word, Excel, Power point and Outlook); know to work on Internet i.e. searching information on search engine, mail writing

To communicate on email learn how to write mails

To analyse the reports and deliver presentations how to compile office presentations, How to make the online sales reporting and facilitate the online product surveys

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
	25	75	100

Name of The Course	Production and Manufacturing-II
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Course Code	BPPM8015			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives:**Course Outcomes**

CO1	The student will be able to develop dermatological dosage form.
CO2	The student will be able to supervise production process in Pharmaceutical industry.
CO3	The student will be able to validate safety and emergency protocols and tools at production soft floor.
CO4	The student will be able to analyze the importance of QMS and SOP in Pharmaceutical industry.
CO5	The student will be able to operate the basic computer tools.

Text Book (s)

Carter S.J., "Cooper and Gunn's Tutorial Pharmacy", CBS Publishers, Delhi.

Rawlins E.A., "Bentley's Text Book of Pharmaceutics", ELBS Bailliere Tynhall.

Lachman L, Liberman H.A and Kanig J.L., "Theory and Practice of Industrial Pharmacy", Lea and Febiger.

Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.

Reference Book (s)

United States Pharmacopoeia (National Formulary).

Remington – "The science and practice of pharmacy" Vol. I & II. Mack Publishing Co., Pennsylvania.

Pharmacopoeia of India, The Controller of Publications, Delhi.

British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge

Unit-1**12 hours****Production Process for Dermatological formulation**

□ Learn and apply the conceptual and practical skills about Production process of Dermatological Formulations covering aspects like:
 Definition of Dermatological products
 Classification and types of dermatological products
 Dermatological product formulations
 Excipients used in formulation and their characteristics
 Process flow chart
 Manufacturing equipment's and process for different types of Dermatological products
 Filling line equipment's and processes
 Cleaning and disinfection of the manufacturing and filling equipment's
 In process testing for Dermatological
 Common manufacturing and filling defects and trouble shooting
 Critical process parameters and critical

Unit-2**12 hours****Supervising a Production Team**

Learn and apply the concept and practical skills for Production Planning, monitor shift-wise production and practice

required documentation like scheduled reports, weekly and monthly review and analysis reports, DPRs etc.

Learn and apply the key concept and practical skills for Training, Supervising and delegating & monitoring in a manufacturing shop floor of Life Sciences Industry including the practical use of psychological concepts

Learn and apply the concepts and practical skills for the required documentation in various production process. Check documents like log book, BMR /BPR, On line documentation entries. Learn and apply the Concepts of GDP and respond to an audit query from QA.

Know and follow generic Organizational Policy & various internal Process.

relevant for Production Chemist

Learn and practice related Core Skills and

Professional Skills: Reading, writing, listening and speaking, Observation & Critical thinking, problem

solving, decision making, customer centricity, plan and organizing, Analytical thinking, Execution

Unit-3

12 hours

Maintain a healthy, safe and secure working environment in the pharmaceutical manufacturing facility

Learn the Basic Concepts of Safety including Hazards, Accidents, Safety Signs and Signals and Henrich Pyramid and follow and practice same at shop floor

Know about Water Systems at Plant, Engineering related tools and techniques to operate the machine safely. Understand the clean room classifications and requirements, Know and follow Clean room behaviour practices

Use Material Data Safety Sheet, and follow the Process of Safety Analysis. Know and follow the Fire Safety concepts and prepare oneself to act in case of Fire Emergency at shop floor. Know about various PPEs used in different production operations and do Job Safety Analysis for Various production machines/equipment and provide these critical information to concerned team members.

Learn and follow the Basic Concepts and practical skills for managing Emergency Procedures and how to do first aid

Learn and practice Related Core Skills and Professional Skills: Reading, writing, listening, speaking, Plan and organize, Critical thinking, problem solving, decision making, customer centricity

Unit-4

12 hours

Coordinate with Shift Supervisor, cross functional teams and within the team

□□Manage Supervisor- Reportee Relationship and identify Partnering Opportunities at work; know and follow General reporting process, protocol and escalation policy. Understand Importance of reports and communication with Supervisor including DPR handover

□ Learn and Use techniques for Collaborating with Other Groups and Divisions in order to achieve

organizational goals

□ Learn and follow the conceptual and practical skills required by Production Chemist in Audits:

Importance of cGMP/QMS/ SOP related documentation

Method to Respond to Audit Queries

How to Face Internal Audit Interactions

Use of IT in communication and coordination

□ Learn and practice Related Core Skills and Professional Skills: Reading, writing, listening, speaking, Analytical thinking, problem solving, decision making, customer centricity.

Unit-5

12 hours

Information Technology Skills

Apply Basic Computer Skills (Ms Office, Internet) at Work. Use Lab Management Information System in a Production plant

Mode of Evaluation: The theory and lab performance of students are evaluated separately.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
0	25	75	100

Name of The Course	Quality Assurance-II			
Course Code	BPQA8016			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives: Course Outcomes

CO1	The student will be able to relate the Regulatory Authorities and Government Policies and their impact on manufacturing in Life Sciences Industry.
CO2	The student will be able to categorise the

	Production Process & Packaging operation of Life Sciences Industry.
CO3	The student will be able to apply the fundamentals of analytical to quality assurance personnel for life sciences industry
CO4	The student will be able to apply the validation process and exhibit staging for quality assurance.
CO5	The student will be able to employ the documentation for quality assurance

Text Book (s):

1. Quality Planning and Analysis / Edition 3 by J. M. Juran, Frank M.
2. An Introduction to Quality Assurance in Health Care by M Perides

Reference Book (s)

1. Remington's Pharmaceutical Sciences.
2. Pharmacopoeia of India, The Controller of Publications, Delhi.
3. United States Pharmacopoeia (National Formulary).

Unit-1 14 hours	Introduction
<p>Documentation for Quality Assurance</p> <p><input type="checkbox"/> Handle vendor & market complaints, provide justification or clarification for customer queries, change controls, internal & external audits.</p> <p>Engineering Skills for Quality Assurance</p> <p>Learn and apply the concept and practical skills for engineering, HVAC, AHU, water systems, compressed air, electricity, and facility requirements, documentation in various process like reporting defects/problem/incidents/quality issues/test results.</p> <p><input type="checkbox"/> Follow the detailed concepts and guidelines of Good Documentation Practices and documentation requirement for Good Manufacturing Practices, building management systems, environment management systems etc</p> <p><input type="checkbox"/> Give an audit justification given for wrong entry done in qualification documents, response to production team and conduct audits for facility, equipment and utilities on periodic basis, understanding on action plans and sticking to the time lines.</p>	

- Rreview and approve Qualification protocols and calibration schedules of equipment and facility, preventive maintenance procedures, design qualification, SOP/URS/Standard control practices, layouts, cleaning validation documents.

Unit-2

14 hours

Ensure Cleanliness in the work area

Gain and apply knowledge of different Material, chemicals and equipment and their cleaning procedure as per manufacturer's guide

- Gain and apply Knowledge about Electronic and Optical Sensors in laboratory equipment
- Follow the methodology for storage area inspection with methods and materials required for cleaning variety of surfaces and equipment, methods to check the treated surface and equipment on completion of cleaning, disposal methods for waste, used/ unused solutions and relevant SOP, Procedures for reporting any unidentified soiling and Escalation procedures for soils or stains that could not be removed
- Practice Related Core Skills and Professional Skills at work like; Reading, writing, listening and speaking, Critical thinking, problem solving, decision making, customer centricity, plan and organizing.

Unit-3

14 hours

Maintain a healthy, safe and secure working environment in the pharmaceutical manufacturing facility and laboratory

Learn and apply the Basic Concepts of Safety including Hazards, Accidents, Safety Signs and Signals and Henriech Pyramid

- Know about Water Systems at Plant, Engineering related tools and techniques to operate the machine safely
- Use Material Data Safety Sheet, follow Process of Safety Analysis. Learn and apply Fire Safety concepts and act in case of Fire Emergency at shop floor. Use various PPEs in different production operations and to do Job Safety Analysis for Various production machines/ equipment
- Learn and apply the Basic Concepts and practical skills for managing Emergency Procedures and how to do first aid.

Practice Related Core Skills and Professional Skills at

work like: Reading, writing, listening, speaking, Plan and organize, Critical thinking, problem solving, decision making, customer centricity.

Unit-4
15 hours

Coordinate with Supervisor, within team and cross functional the teams

Manage Supervisor- Reportee Relationship including identify Partnering Opportunities at work; orientation on General reporting process, protocol and escalation policy and Importance of reports and communication with Supervisor

- Interact with cross functional teams while conducting internal audits and communicate the audit observations
- Use the techniques for Collaborating with Other Groups and Divisions
- Apply the conceptual and practical skills required by QC Chemist in Audits
- Know about Importance of cGMP/ GLP/ GDP/QMS/ SOP/ regulatory requirements related documentation
- Follow the Method to Respond to Audit Queries
- Face Internal Audit Interactions
- Use IT in communication and coordination
- Practice Related Core Skills and Professional Skills at work: Reading, writing, listening, speaking, Analytical thinking, problem solving, decision making, customer centricity

Unit-5
15 hours

Information Technology Skills

Use Basic Computer Skills (Ms Office, Internet)+ Typing at Work

- Handle different software's used to operate the QC instruments
- Apply the knowledge on 21 CFR Part 11 compliance system and its requirements.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
0	25	75	100

Name of The Course	Quality Control-II			
Course Code	BPQC8017			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives:

The student will be able to understand the whole process of the quality control department.

Course Outcomes

CO1	The student will be able to understand the basic role of quality control chemist
CO2	The student will be able to understand the production process of Life science industry.
CO3	The student will be able to understand the fundamentals of Instrumental Analysis of the Life Sciences Industry
CO4	The student will be able to analyze the Operating Knowledge of Analytical Instruments
CO5	The student will be able to Perform Quality Checks in Quality Control Process

Text Book (s):

1. Textbook of Quality control chemist, LSSSDC
2. Remington: The Science and Practice of Pharmacy

Unit-1 14 hours	Introduction
Documentation for Quality Control	
Learn the concept and practical skills for Work Planning of Quality Control and required documentation in various Quality Control Process like reporting defects/problem/incidents/quality issues/test results considering Data integrity aspects and follow the learnings while documentation for quality control. Learn and follow the detailed concepts of Good Documentation Practices and Knowledge about importance of Data Integrity and how to complete documentation in line with Good Laboratory Practices and Good Manufacturing Practices.	

Provide a detailed response to an audit / process related query from any cross-functional team and Quality assurance team.

Know and follow generic Organizational Policy & various internal Process relevant for QC Chemist like reporting unresolved issues, hazards, escalations, test point recording requirements etc.

Learn and practice Related Core Skills and Professional Skills: Reading, writing, listening and speaking, Critical thinking, problem solving, decision making, customer centricity, plan and organizing, Analytical thinking.

Unit-2

14 hours

Maintain a healthy, safe and secure working environment in the pharmaceutical manufacturing facility and laboratory

Learn and follow the Basic Concepts of Safety including Hazards, Accidents, Safety Signs and Signals and Henrich Pyramid and use the PPE and safety tools like eye shower etc.

- Know about Water Systems at Plant, Engineering related tools and techniques to operate the machine safely.
- Use Material Data Safety Sheet, follow the Process of Safety Analysis, Handle Hazardous Material in Lab, know and follow Fire Safety concepts and how to act in case of Fire Emergency at shop floor. Know about various PPEs used in different production operations and do Job Safety Analysis for Various production machines/ equipment.
- Learn and follow the Basic Concepts and practical skills for managing Emergency Procedures and how to do first aid.
- Practice Related Core Skills and Professional Skills: Reading, writing, listening, speaking, Plan and organize, Critical thinking, problem solving, decision making, customer centricity.

Unit-3

14 hours

Ensure Cleanliness in the work area.

Gain Knowledge of different Material, chemicals and equipment and their cleaning procedure as per manufacturer's guide.

Gain Knowledge about Electronic and Optical Sensors in laboratory equipment and their operations

as per the manual.

Know and Follow methodology for storage area inspection with methods and materials required for cleaning variety of surfaces and equipment, methods to check the treated surface and equipment on completion of cleaning, disposal methods for waste, used/ unused solutions and relevant SOP, Procedures for reporting any unidentified soiling and Escalation procedures for soils or stains that could not be removed.

- Practice Related Core Skills and Professional Skills: Reading, writing, listening, speaking, Plan and organize, Critical thinking, problem solving, decision making, customer centricity.

Unit-4

15 hours

Coordinate with Supervisor, within team and cross functional the teams.

Manage Supervisor- Reportee Relationship including identify Partnering Opportunities at work; Know and follow General reporting process, protocol and escalation policy and Importance of reports and communication with Supervisor.

- Apply techniques for Collaborating with Other Groups and Divisions.
- Learn and follow the conceptual and practical skills required by QC Chemist in Audits: Importance of CGMP/ GLP/ GDP/QMS/ SOP related documentation
- Method to Respond to Audit Queries
- How to Face Internal Audit Interactions
- Use of IT in communication and coordination. and Professional Skills: Reading, writing, listening, speaking, Analytical thinking, problem solving, decision making, customer centricity.

Unit-5

15 hours

Information Technology Skills

Apply Basic Computer Skills (Ms Office, Internet)+ Typing Practice at Work.

- Handle different software's used to operate the QC instruments.
- Gain and apply Knowledge about 21 CFR Part 11 compliance system and its requirements.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Test (ETE)	Total Marks
0	25	75	100

Name of The Course	Medical Sales Representative-II Lab			
Course Code	BPMR8018			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

This subject involves the practical aspects in personality development, better communication, marketing research, public relation, professional relation with medical companies, hospitals to conduct smooth work flow by a MSR.

Course Outcomes

CO1	Apply communication skill, group tasking, to become more effective in meetings, and making presentations
CO2	Analyze a strong cross-cultural element, giving participants an ideal opportunity to see issues from an entirely new perspective

Text Book (s):

1. Mastering the Complex Sale Second Edition by Jeff Thull.
2. How to Master the Art of Selling by Tommy Hopkins
3. How to Win Friends and Influence People by Dale Carnegie.

Reference Book (s)

1. Secrets of Closing the Sale by ZigZiglar.
2. Smart Guide to Becoming a Medical Sales Representative (English, Paperback, Penny Dhanjal)
3. How to Master the Art of Selling by Tommy Hopkins.

List of Experiments	
1	Offer an opportunity to share the experiences of others who are at a similar stage of their careers.

2	Help participants to become more effective in meetings, in making presentations and in their use of informal English.
3	Have a strong cross-cultural element, giving participants an ideal opportunity to see issues from an entirely new perspective.
4	Have an external component, such as a specialist speaker, workshop or external visit.
5	Develop the practical skills required for participants to succeed in a constantly-evolving global workplace.
6	Introduce of basic knowledge about Regulatory Authorities and Government Policies
7	Introduce of rules and Regulations (CDSCO/NPPA/ MRTP Act)
8	Introduction to Organization Structure, Benefits and typical sales function in a Life Sciences organization.
9	Introduction the Role of a MSR.
10	Introduction to MCI Code of Conduct guidelines for MSR and UCP-MP Act.
11	Introduction to develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector.
12	Deliver presentations to doctors, pharmacists and other potential customers. Introduction to develop strategies to increase opportunities to meet and connect with contacts in the medical and healthcare sector.
13	Organizing medical conferences and promotional events. Arranging the conference/ promotional event (CMEs)
14	Core skill professional skills related to organizing medical conferences and promotional events
15	Information technology skills. Introduction to analyse the reports and deliver presentations.

Continuous Assessment Pattern

Internal Assessment	Sessional Examination	End Term	Total Marks
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(IA)		Test (ETE)	
	15	35	50

Name of The Course	Production and manufacturing- II Lab			
Course Code	BPPM8019			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:**Course Outcomes**

CO1	Students will be able to prepare liquid dosage form.
CO2	Students will be able to prepare SOP
CO3	Students will be able to develop knowledge about BPR/BMR/DPR.

Text Book (s):

- Quality Planning and Analysis / Edition 3 by J. M. Juran, Frank M.
- An Introduction to Quality Assurance in Health Care by M Perides

Reference Book (s)

- Remington's Pharmaceutical Sciences.
- Pharmacopoeia of India, The Controller of Publications, Delhi.
- United States Pharmacopoeia (National Formulary).

List of Experiments	
1	To prepare and evaluate pharmaceutical suspension
2	To study the importance of SOP
3	To study the difference between Type A and Type B cleaning
4	To study the importance of DPR.
5	To study the effect of various emulsifying agent in the stability of emulsion.

6	To study the various document such as log book and BMR/BPR.
7	To study the effect of various suspending agent in the stability of suspension.
8	To study the working of turbidity meter.
9	To prepare and submit zinc oxide paste.
10	To prepare and submit potassium permanganate gargles.
11	To study the importance of log book in Pharmaceutical industry.
12	To study about the line clearance.
13	Study about various possible chances of errors in product packaging.
14	To prepare and submit bulk powder.
15	To draw a schematic diagram of homogenizer

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test (ETE)	Total Marks
	15	35	50

Name of The Course	Quality Assurance-II Lab			
Course Code	BPQA8020			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:**Course Outcomes**

CO1	The student will be able to perform and study about various instruments like FTIR, UV etc.
CO2	The student will be able to perform the process of safety analysis.
CO3	The student will be able to perform calibration

	of various equipments.
CO4	The student will be able to apply the concept of various types of cleaning procedure as per manufacturers guidelines.
CO5	The student will be able to employ standard operating procedure.

Text Book (s):

1. Quality Planning and Analysis / Edition 3 by J. M. Juran, Frank M.
2. An Introduction to Quality Assurance in Health Care by M Perides

Reference Book (s)

1. Remington's Pharmaceutical Sciences.
2. Pharmacopoeia of India, The Controller of Publications, Delhi.
3. United States Pharmacopoeia (National Formulary).

List of Experiments	
1	To study and perform conductivity meter
2	To study about the filling machine
3	To study and perform type filling machine
4	To study the calorimeter
5	To perform assay by UV analyzer
6	To study the FT-IR
7	To perform the sieve shaker
8	To study the polarimeter
9	To study and perform bulk density and tapped density tester.
10	To study the melting point apparatus
11	To study about friabilator
12	To perform test of Karl Fisher apparatus
13	To study the process of safety analysis
14	To study about various types of cleaning procedure as per manufacturers guidelines
15	Give detail about sample engineering layouts

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test	Total Marks

		(ETE)	
	15	35	50

Name of The Course	Quality Control- II Lab			
Course Code	BPQC8021			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

The main purpose of subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the pharmaceutical industry. It helps in the understanding of the role of quality control chemist in the coordination of an organization.

Course Outcomes

CO1	The student will be able to perform the Quantitative test for the analysis of the drug.
CO2	The student will be able to perform the Qualitative tests of the given drug.
CO3	The student will be able to execute the demo process with the GMP (Good Manufacturing Practices) and GLP (Good Laboratory Practices).

Text Book (s):

1. Textbook of Quality control chemist, LSSSDC
2. Remington: The Science and Practice of Pharmacy

List of Experiments	
1	To Study the importance of GLP
2	To study the essential parameters of QC chemist
3	To study the Importance of API for the efficient functioning of any industry .

4	To Determine the effect of Self Inspection and Quality control..
5	To determine the purity of marketed drug through UV.
6	To determine the purity of marketed drug through IR.
7	To study the Importance safty of the workers for good organisation.
8	To prepare and check 50 ml chloroform water IP 1966.
9	To prepare and check 20 ml of aqueous iodine solution IP.
10	To prepare and check 20 g of simple syrup IP.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Test (ETE)	Total Marks
	15	35	50

School of Medical & Allied Sciences



COURSE BOOK - 2020

Volume-xx



**Curriculum & Syllabus
2020-2021**

**School of Medical & Allied Sciences
Program: M. Pharm (Pharmaceutics)**

Vision:

To be recognized globally as a premier school in the field of Pharmaceutical Sciences for imparting value based education, and engaged in multidisciplinary and collaborative research.

Mission:

M1. Establish state-of-the-art facilities to analyze develop test and invent new methods in Pharmaceutical Science by involving multiple stakeholders

M2. Establishing center of excellences for multidisciplinary collaborative research by involving industries and academia

M3. To train the students and faculties into analytical approach and developing new products specially in Natural and Herbal pharmaceutical products

Programme Educational Objectives (PEOs):

Post-Graduate shall be able:

PEO1: To bear strong professional competence in Pharmaceutical Sciences with innovative approaches in R & D.

PEO2: To undertake the responsibilities in health care system with understanding of needs of Industry/ Government organizations.

PEO3: To imbibe unique expertise to develop entrepreneurship and acumen for sustainable development.

Programme Specific Outcomes (PSOs):

Post Graduate shall be able:

PSO1: To know the basis of formulation aspects of drugs and excipients in order to design efficacious and stable dosage forms.

PSO2: To evolve in the area of novel drug delivery system with reference to formulation development and their optimization.

PSO3: To execute the higher education and research projects that lead to develop commercial product /services.

Program Outcomes-Pharmacy

1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; Pharmaceutical sciences; behavioral, social, and administrative issues of Pharmacy sciences.
2. **Analytical Skill:** Graduates should be efficient in scrutinizing and identifying any deviations from basic theories learned
3. **Application mode:** Graduates should be able to handle independently any difficult situations in all related fields of Pharmaceutical Sciences and shall able to modify therapeutic applications without diminishing core values.
4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
6. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
7. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
8. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
9. **Pharmaceutical Ethics:** Honor personal values Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
10. **Communication:** Communicate effectively with the community and with society, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

11. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
12. **Environment and sustainability:** understand the impact of the professional pharmacy solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
13. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

CURRICULUM & PGROGRAMME STRUCTURE

As per course regulations 2014 and Scheme and syllabus
implemented from 2016-17 academic sessions

M.Pharm (Pharmaceutics)

M.Pharm (Pharmaceutics) Programme Structure (LTPC)**Semester I**

Course Code	Subject	L	T	P	C	Examinations/Assessments			
						Internal Assessments		End Semester Examination	
						Continu ous Mode	Sessional Exam	End Semester Exams	Total
MPHT1001	Modern Pharmaceutical Analytical Techniques	4	0	0	4	10	15	75	100
MPHT1002	Drug Delivery System	4	0	0	4	10	15	75	100
MPHT1003	Modern Pharmaceutics	4	0	0	4	10	15	75	100
MPHT1004	Regulatory Affair	4	0	0	4	10	15	75	100
MPHP1005	Pharmaceutics Practical I	0	0	12	6	20	30	100	150
MPHA1006	Seminar/Assignment	0	0	7	4	--	--	100	100
	Total	16	0	19	26				650

Semester II

Course Code	Subject	L	T	P	C	Examinations/Assessments			
						Internal Assessments		End Semester Examinations	
						Continu ous Mode	Sessional Exam	End Semester Exams	Total
MPHT2001	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	0	0	4	10	15	75	100
MPHT2002	Advanced Biopharmaceutics & Pharmacokinetics	4	0	0	4	10	15	75	100
MPHT2003	Computer Aided Drug Delivery System	4	0	0	4	10	15	75	100
MPHT2004	Cosmetic and Cosmeceuticals	4	0	0	4	10	15	75	100
MPHP2005	Pharmaceutics Practical II	0	0	12	6	20	30	100	150
MPHA2006	Seminar/Assignment	0	0	7	4	--	--	100	100
	Total	16	0	19	26				650

Semester III

Course Code	Subject	L	T	P	C	Examinations/Assessments				
						Internal Assessments			End Semester Examinations	
						Contin uous Mode	Session al Exam	Total	End Semeste r Exams	Tota l
MRMT3001	Research Methodology and Biostatistics*	4	0	0	4	10*	15	25	75	100
MPHJ3002	Journal club	1	0	0	1	--	--	25**	--	25
MPHD3003	Discussion / Presentation (Proposal Presentation)	2	0	0	2	--	--	50**	--	50
MPHR3004	Research Work*	0	0	28	14	--	--	--	350	350
	Total	7	0	28	21					525

***Continuous Mode **Internal Assessment**

Semester IV

Course Code	Subject	L	T	P	C	Examinations/Assessments				
						Internal Assessments			End Semester Examinations	
						Continu- ous Mode	Sessiona l Exam	Total	End Semeste r Exams	Tota l
MPHJ4001	Journal Club	1	0	0	1	--	--	25**	--	25
MPHD4002	Discussion / Presentation (Proposal Presentation)	3	0	0	3	--	--	75**	--	75
MPHR4003	Research Work and Colloquium	0	0	31	16	--	--	--	400	400
	Total	4	0	31	20					500

***Continuous Mode **Internal Assessment**

Detailed Syllabus

Name of The Course	Modern Pharmaceutical Analytical Techniques			
Course Code	MPHT1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

1. After completion of course student is able to know Various spectral techniques of analysis
2. The analysis of various drugs in single and combination dosage forms
3. Theoretical and practical skills of the instruments

Course Outcomes

CO1	Remembring the Theory, Instrumentation and applications of UV-Visible spectroscopy, IR spectroscopy and Spectroflourimetry
CO2	Understanding the basic principle of NMR spectroscopy.
CO3	Analyzing the basic principle, instrumentation, chromatographic parameters, factors affecting resolution and applications of Chromatography.
CO4	Analyzing the basic principle, instrumentation, chromatographic parameters, factors affecting resolution and applications of Chromatography.
CO5	Evaluating the basic Principle, Instrumentation, Working conditions, factors affecting separation and applications of Electrophoresis, Immunological assays and X ray Crystallography
CO6	Evaluating the basic Principle of Immunological assays

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit I: UV-Visible, IR, Spectroflourimetry 11 Hours
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- a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy.
- b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy
- c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
- d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

Unit II: NMR spectroscopy

11 Hours

Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy.

Unit III: Mass Spectroscopy 11 Hours

: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.

Unit IV: Chromatography 11 Hours

Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following:

- a) Paper chromatography
- b) Thin Layer chromatography
- c) Ion exchange chromatography
- d) Column chromatography
- e) Gas chromatography
- f) High Performance Liquid chromatography
- g) Affinity chromatography

Unit V: Electrophoresis

11Hours

a.: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:

- a) Paper electrophoresis
 - b) Gel electrophoresis
 - c) Capillary electrophoresis
 - d) Zone electrophoresis
 - e) Moving boundary electrophoresis
 - f) Isoelectric focusing
- b. X ray Crystallography: Production of X rays, Different X ray diffraction methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X ray

Unit VI Immunological assays:

RIA (Radio-Immuno assay), ELISA, Bioluminescence assays. Chemiluminescence for reactive oxygen species sensing and imaging analysis, high-throughput ADME screening in drug discovery, characterization and quantification of antibody-drug conjugates, nucleic acid detection for coronavirus

Suggested Readings:

Text and Reference Books

1. **Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.**

2. **Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.**

3. **Instrumental methods of analysis – Willards, 7th edition, CBS publishers.**

4. **Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.**

5. **Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.**

6. **Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.**

7. **Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series**

Name of The Course	Drug Delivery System			
Course Code	MPHT1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The basic objective of this course is to get familiar with product development. Upon completion of the course, student shall be able to understand,

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of delivering system
- The formulation and evaluation of Novel drug delivery systems.

Course Outcomes

CO 1	Student will be able to get familiar with Pre-formation and concepts and sustained release and controlled release formulations
CO 2	Students will be able to optimize Pharmaceutical formulation.
CO 3	Students will be able to develop different formulation on rate controlled drug delivery systems.
CO 4	Students will be able to develop the skills to solve different types of problems in solving the drug delivery.
CO 5	Students will be able to learn about the Ocular Drug Delivery Systems & Transdermal Drug Delivery Systems.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Examination	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

UNIT 1:	12 H
Sustained Release (SR) and Controlled Release (CR) formulations:	
Sustained Release (SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of Pharmaceuticals, Tele-pharmacy.	
UNIT 2:	12H

Rate Controlled Drug Delivery Systems	
Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, Ph activated, Enzyme activated, and Osmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.	
UNIT 3:	12 H
Gastro-Retentive Drug Delivery Systems:	
Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco-adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.	
UNIT 4:	12H
Ocular Drug Delivery Systems & Transdermal Drug Delivery Systems:	
Ocular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers. Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and Evaluation.	
UNIT 5:	12H
Protein and Peptide Delivery & Vaccine delivery systems:	
Protein and Peptide Delivery: Barriers for protein delivery. Formulation and evaluation of delivery systems of proteins and other macromolecules. Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	
UNIT 6:	8H
Recent Advancement in Drug Delivery System:	
Recent advancements in novel drug delivery systems: Novel multifunctional nanoparticles and cancer targeting, Future Opportunities and Challenges in novel drug delivery system, Microwave assisted drug delivery system, Applications and Markets in novel drug delivery system.	

Suggested Reading:

Text Books

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
4. S.P. Vyas and R. K. Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Reference Books

1. Encyclopaedia of Pharmaceutical technology, Vol I – III.
2. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
3. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

Name of The Course	Modern Pharmaceutics			
Course Code	MPHT1003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

- The cGMP aspects in a pharmaceutical industry
- To appreciate the importance of documentation
- To understand the scope of quality certifications applicable to Pharmaceutical industries
- To understand the responsibilities of QA & QC departments.

Course Outcomes

CO1	Student will be able to get familiar with pre-
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	formation concepts.
CO2	Students will be able to optimize pharmaceutical formulation development in the era of modern pharmaceuticals.
CO3	Students will be able to develop validation methods for the different pharmaceutical products.
CO4	Students will be able to develop the skills to solve different types of problems in solving the pharmaceutical research.
CO5	Students will be to learn the industrial management in pharmacy.
CO6	Students will be to learn the stability issues and protection of pharmaceutical products.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1:	12 Hours
<p>Preformulation Concepts- Drug Excipients interactions - different methods, kinetics of stability, Stability testing. Theories of dispersion and Pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parenteral- physiological and formulation consideration, Manufacturing and evaluation.</p> <p>Optimization techniques in Pharmaceutical Formulation: Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation.</p>	
Unit-2	12 hours
<p>Validation: Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities.</p>	
Unit-3	12 hours
<p>cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of</p>	

buildings, services, equipments and their maintenance
Production management: Production organization, materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of total Quality Management.

Unit-4 **12 hours**

Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles. Solubility.

Unit-5 **12 hours**

Study of consolidation parameters; Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckel plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation, Chi square test, students T-test, ANOVA test.

Unit-6 **8 hours**

Kinetic Principal and Stability Testing: Introduction, theoretical consideration, Order of reaction, ICH guidelines, Shelf life testing of drug products, Chemical and Physical Stability Testing of Pharmaceutical dosage forms, Influence of packaging components on dosage forms stability.

Suggested Reading:

Text Books

1. Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
2. Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
3. Banker G.S., & Rhodes C.T., Modern Pharmaceutics, Marcel Dekker, New York.
4. Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H.Beckett.

Reference Books

1. Encyclopaedia of Pharmaceutical technology, Vol I – III.
2. Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Second edition; By Sidney H. Willig.

3. Applied production and operations management; By Evans, Anderson, Sweeney and Williams
4. Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.

Name of The Course	Regulatory Affair			
Course Code	MPHT1004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The basic objective of this course is to get familiar with Drug Regulatory affairs. Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilance and process of monitoring in clinical trials

Course Outcomes

CO1	To know about the Pharmaceutical legislations, documentation & their implications in the development and marketing
CO2	To know the Regulatory guidance's and guidelines of NDA, ANDA etc for filing and approval process
CO3	To know the various Indian pharmaceutical Acts, Laws, schedule and regulatory guidelines for approval/post approval of the product in the market.
CO4	To know the Non clinical drug development i.e., Global submission of IND, NDA, ANDA and investigational brochure etc
CO5	To know the clinical study process and approval of the product as per regulatory guidelines.
CO6	To know recent advancement in regard to Pharmaceutical Legislation as per Indian regulatory perspectives for drug or drug related

products to the society as well nations.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1 & 2: 24 Hours

a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction , Hatch-Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION), drug product performance, in-vitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, *in-vivo*, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO.

b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs.

Unit-3 12 hours

CMC, post approval regulatory affairs. Regulation for combination products and medical devices. CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries.

Unit-4 12 hours

Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB).

Unit-5 12 hours

Unit 5:
Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, Pharmacovigilance safety monitoring in clinical trials.

Unit-6 12 hours

Recent aspects of Pharmaceutical legislations in India: Hierarchy and working flow of FDA in India, Roles of DCGA and CDSCO in drug control, Drug Control Authority and its documentation in the state.

Suggested Reading:

Text Books

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargeland Isader Kaufer, Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R.Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185, Informa Health care Publishers
3. New Drug Approval Process: Accelerating Global Registrations by Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.

Reference Books

1. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/edited By Douglas J. Pisano, David Mantus
2. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
3. <https://www.tga.gov.au/tga-basics>
4. europa.eu/index_en.htm, www.fda.gov/

Name of The Course	MOLECULAR PHARMACEUTICS (NANO TECH AND TARGETED DDS)			
Course Code	MPHT2001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The basic objective of this course is to get familiar with nanotechnology for targeted delivery approaches. After completion of course student is able to know,

- Novel Drug delivery System
- Targeted drug delivery using adjuvant approaches
- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of NDDS
- The formulation and evaluation of novel drug delivery systems.

Course Outcomes

CO1	To know the concept of targeted drug delivery system
CO2	To know various methodologies for targeted action of the said formulation for better therapeutic effect
CO3	The various approaches for development of Monoclonal antibodies based drug delivery system
CO4	To know the criteria for selection of drugs and polymers for the development of Pulmonary drug delivery system
CO5	To know the preparation of formulation and evaluation as well as Bio-distribution and Pharmacokinetics studies of different antisense molecules and aptamers as drugs of future
CO6	To know the need of drug targeting for Brain and its application for different brain disorders.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1:	12 Hours
Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery.	
Unit-2	12 hours
Targeting Methods: Introduction preparation and evaluation. Nanoparticles & Liposomes: Types, preparation and evaluation.	
Unit-3	12 hours
Micro Capsules / Micro Spheres: Types, preparation and evaluation, Monoclonal Antibodies; preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes, Electrosomes.	
Unit-4	12 hours
Pulmonary Drug Delivery Systems : Aerosols, Propellents, Containers Types, preparation and evaluation, Intra Nasal Route Delivery systems;	

Types, preparation and evaluation.	
Unit-5	12 hours
Nucleic acid based therapeutic delivery system: Gene therapy, introduction (<i>ex-vivo&in-vivo</i> gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and non-viral gene transfer). Liposomal gene delivery systems. Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules and aptamers as drugs of future.	
Unit-6	8 hours
Advanced Targeted system for Brain: Introduction, Need of targeting, Formulation advancements, Literature discussion, Applications	

Suggested Reading:

Text Books

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992
1. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
2. S.P.Vyas and R.K. Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.
3. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997

Reference Books

1. Encyclopaedia of Pharmaceutical technology, Vol I – III.
2. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
3. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

Name of The Course	Advanced Biopharmaceutics & Pharmacokinetics
Course Code	MPHT2002
Prerequisite	
Co-requisite	

Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

- The basic concepts in Biopharmaceutics and Pharmacokinetics.
- The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- The critical evaluation of biopharmaceutic studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic

Course Outcomes

CO1	Student will be able to understand about absorption, mechanism of absorption and dissolution.
CO2	Student will be able to understand about biopharmaceutical factors affecting dosage form and rate limiting steps.
CO3	Student will be able to Calculate different Pharmacokinetic parameters using Compartmental models.
CO4	Student will be able to Design of Bioavailability & Bioequivalence studies and their Clinical Significance.
CO5	Student will be able to Generalize the concept of Pharmacokinetics and Pharmacodynamics of biotechnology drugs. Monoclonal antibodies, Vaccines, Gene therapies.
CO6	Students will be able to solve practical application approach to solve the task and problems.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1:	12Hours
<p>Drug Absorption from the Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH-partition theory of drug absorption. Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes-Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form, Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution methods, Formulation and processing factors, Correlation of <i>in vivo</i> data with <i>in vitro</i> dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex.</p>	
Unit-2	12 hours
<p>Rate Controlled Drug Delivery Systems Biopharmaceutic considerations in drug product design and <i>in vitro</i> Drug Product Performance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, <i>in vitro</i>: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. <i>In vitro-in vivo</i> correlation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product.</p>	
Unit-3	12 hours
<p>Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment</p>	

model: two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of k_{max} and V_{max} . Drug interactions: introduction, the effect of protein binding interactions, the effect of tissue-binding interactions, cytochrome p450-based drug interactions, drug interactions linked to transporters.

Unit-4 12hours

Drug Product Performance, *in vivo* Bioavailability and Bioequivalence:
drug product performance, purpose of bioavailability studies, relative and absolute availability. Methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. Biopharmaceutics classification system, methods. Permeability: *In-vitro*, *in-situ* and *In-vivo* methods. Generic biologics (biosimilar drug products), clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generics substitution

Unit-5 12 hours

Application of Pharmacokinetics:
Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and Pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies.

Unit-6 08 hours

Applied problems/ questions related to Drug Absorption from the Gastrointestinal Tract, Rate Controlled Drug Delivery Systems, Pharmacokinetics, Drug Product Performance, *in vivo* Bioavailability and Bioequivalence.

Suggested Readings

Text Books

1. Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmkar and Sunil B. Jaiswal., VallabPrakashan, Pitampura, Delhi

- Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath, Prism Book
- Biopharmaceutics and Pharmacokinetics, Javed Ali, Alka Ahuja, R.K.Khar, Birla Publications, Shahadra, Delhi
- Basic Pharmacokinetics, 1st edition, Sunil S Jambhekar and Philip J Breen, pharmaceutical press, RPS Publishing, 2009.

Reference Books

- Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition, Philadelphia, Lea and Febiger, 1991
- Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2nd edition, Connecticut Appleton Century Crofts, 1985
- Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, revised and expanded by Robert. E. Notari, Marcel Dekker Inc, New York and Basel, 1987.
- Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G. Boylan, Marcel Dekker Inc, New York, 1996.

Name of The Course	COMPUTER AIDED DRUG DELIVERY SYSTEM			
Course Code	MPHT2003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

- The students will be able to understand History of Computers in Pharmaceutical Research and Development
- Computational Modeling of Drug Disposition
- Computers in Preclinical Development
- Optimization Techniques in Pharmaceutical Formulation

Course Outcomes

CO1	The student will be able to interpret the basic concept of in-silico studies in the drug discovery
CO2	The student will be able to apply the effect of different parameters of Drug Disposition through computer modeling.
CO3	The student will be able to analyze the concept of optimization for the development of drug formulation.
CO4	The student will be able to assess the role of computer simulation study to get the effective pharmacodynamic and pharmacokinetic parameters
CO5	The student will be able to estimate the importance of artificial intelligence in the future development of pharmaceutical drug research
CO6	The student will be able to analyze the advances in drug delivery systems

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

<p>Unit I: Computers in Pharmaceutical Research and Development and QBD 12 Hours</p> <p>a. Computers in Pharmaceutical Research and Development: A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling .</p> <p>b. Quality-by-Design In Pharmaceutical Development: Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically based QbD - examples of application.</p>
<p>Unit II: Computational Modeling Of Drug Disposition 12 Hours</p> <p>Computational Modeling Of Drug Disposition: Introduction, Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution, Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter.</p>
<p>Unit III: Computer-aided formulation development: 12 Hours</p> <p>Computer-aided formulation development: Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical</p>

emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis.
Unit IV: Computer-aided biopharmaceutical characterization
12 Hours
a. Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in-vitro in-vivo correlation, Biowaiver considerations
b. Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes.
c. Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems.
Unit V: Artificial Intelligence (AI),
12 Hours
Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions.
Unit VI Advances in drug delivery systems 08 Hours
Advances in drug delivery systems with respect to buccal, nasal, ocular, pulmonary, ocular delivery.

Suggested Reading

1. **Computer Applications in Pharmaceutical Research and Development, Sean Ekins, 2006, John Wiley & Sons.**

2. **Computer-Aided Applications in Pharmaceutical Technology, 1st Edition, Jelena Djuris, Woodhead Publishing**

3. **Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New**

Name of The Course	Cosmetic and Cosmeceuticals			
Course Code	MPHT2004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.

- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and Cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

Course Outcomes

CO1	The students will be able to understand basic definitions of cosmetics and cosmeceuticals and different regulatory provisions relating to import and manufacturing of cosmetic products as per Indian regulatory guidelines
CO2	The students will be able to apply the concepts in regard to biological aspects, to be familiar with cosmetology for different cosmetic related problems in context to human health.
CO3	The students will be able to analyze the properties of different building block materials to formulate the cosmetics and cosmeceutical formulation.
CO4	The students will be able to apply knowledge and skills necessary for cosmetics and cosmeceuticals formulations using current technologies in cosmetic industry
CO5	The students will be able to investigate herbs extracts and the evaluated formulations containing herbs are then passed to get approval for marketing. Students will be able to develop scientific knowledge about cosmetics and cosmeceuticals formulations with desired Safety, stability, and efficacy which are desirable for the human subjects.
CO6	Recent Advancements in Cosmeceutical Formulation: The students will be able to understand recent trends in cosmeceuticals i.e., nanotechnology and artificial intelligence application role in cosmetic industry.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1:	12 Hours
Cosmetics – Regulatory: Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for	

labeling of cosmetics Regulatory provisions relating to import of cosmetics, Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties.

Unit-2 **12 hours**

Cosmetics - Biological aspects: Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm.

Unit-3 **12 hours**

Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and tooth paste. Soaps and syndet bars. Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation. Controversial ingredients: Parabens, formaldehyde liberators, dioxane.

Unit-4 **12 hours**

Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor, dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.

Unit-5 **12 hours**

Herbal Cosmetics: Herbal ingredients used in Hair care, skincare and oral care. Review of guidelines for herbal cosmetics by private bodies like Cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.

Unit-6 **8 hours**

Recent Advancements in Cosmeceutical Formulation:

Role of Nanotechnology in Cosmeceuticals, Future Challenges in Cosmeceutical Formulation, Artificial Intelligence for Beauty and Cosmetics, Benefits of Using AI for the Beauty Industry.

Text Books

1. Harry's Cosmeticology. 8th edition.
2. Poucher's perfume cosmetics and Soaps, 10th edition.
3. Cosmetics - Formulation, Manufacture and quality control, PP.Sharma, 4th edition
4. Handbook of cosmetic science and Technology A.O.Barel, M.Paye and H.I. Maibach. 3rd edition

Reference Books

1. Cosmetic and Toiletries recent suppliers catalogue.
2. CTFA directory

Name of The Course	RESEARCH METHODOLOGY & BIOSTATISTICS			
Course Code	MRMT3001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

Upon completion of the course, the student shall be able to understand:

The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data. It also informs the students, how the present research work writing and correlating.

Course Outcomes

CO1	Student will be able to get familiar with Research Methodology & Biostatistics.
CO2	Students will be able to develop problem solving skills in research and development.
CO3	Students will be able to develop good presentation skills to their research work.
CO4	Students will be able to develop the skills to solve different types of problems in solving the Pharmaceutical research.
CO5	Students will be developing the listening skills and effective written communication
CO6	Students will be able to explore to create

Suggested Reading:

	trend/innovation for different novel research methodology and to learn futuristic biostatistics problem solving related to proposed research work.
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Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
10	15	75	100

Course Content:

Unit- 1:	12 Hours
General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.	
Unit-2	12 hours
Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests(students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (Wilcoxon rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.	
Unit-3	12 hours
Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.	
Unit-4	12 hours
CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.	
Unit-5	12 hours

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.

Unit-6 **8 hours**

Recent advancement in Research Methodology and Biostatistics: Innovative trend analysis methodology, The quantity synthesis of single subject research: Methodology and validation, A comparison of online versus on-site training in health research methodology: a randomized study, The future of biostatistics: expecting the unexpected.

Suggested Readings:

1. Kapoot R. L. – Qualitative Methods in Mental Health Research, Published by National Institute of Advanced Studies , Bangalore.
2. Kumar- Research Methodology, 2nd Edition 1999, Published by Laxmi Narain Agarwal. Agra.
3. R. Raveendran and B. Gitanjali, A practical approach to P.G. disseratation, 1997, Jaypee Publishers, New Delhi
4. Major R. H. - A History Of Medicine, 2 volumes, charles Thomas Publishers, Springfield Illinois, U.S.A.

Name of The Course	Pharmaceutics Practical-I			
Course Code	MPHP1005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	12	6

Course Objectives

To get familiar with product development of different dosage forms. Product development may involve modification of an existing product or formulation of an entirely new product. It involves the formulation of different dosage forms and their evaluations.

CO1	Students will be skilled to perform and evaluate pre-formulation and formulation of dosage forms
CO2	Students will be skilled to operate sophisticated instruments.

CO3	Students will able to formulate different dosage form.
CO4	Students will able to evaluate different parameters of dosage form.
CO5	Students will able to analyze and plot different graphs for dosage form.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
20	30	100	150

Course Content:

Experiment No-1: Analysis of Pharmacopoeial compounds and their formulations by UV spectrophotometer				
Experiment No-2: Simultaneous estimation of multi component containing formulations by UV spectrophotometry				
Experiment No-3: Experiments based on HPLC				
Experiment No-4: Experiments based on Gas Chromatography				
Experiment No-5: Estimation of riboflavin/quinine sulphate by fluorimetry				
Experiment No-6: Estimation of sodium/potassium by flame photometry				
Experiment No-7: To perform <i>In-vitro</i> dissolution profile of CR/ SR marketed formulation				
Experiment No-8: Formulation and evaluation of sustained release matrix tablets				
Experiment No-9: Formulation and evaluation osmotically controlled DDS				
Experiment No-10: Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS				
Experiment No-11: Formulation and evaluation of mucoadhesive tablets.				
Name of The Course	Pharmaceutics Practical-II			
Course Code	MPHP2005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	12	6

Course Objectives

The basic objective of this course is to get familiar with product development in Advances in Drug Delivery. It involves the formulation of different dosage forms and their evaluations.

CO1	Students will be skilled to perform and evaluate Pre-formulation and formulation of dosage forms.
CO2	Students will be skilled to operate sophisticated instruments.
CO3	Students will able to formulate different dosage form.
CO4	Students will able to evaluate different parameters of dosage form.
CO5	Students will able to analyze and plot different graphs for dosage form.

Continuous Assessment Pattern

Internal Assessment (IA)	Sessional Exam	End Term Exam (ETE)	Total Marks
20	30	100	150

Course Content:

Experiment No-1: To study the effect of temperature change, non solvent addition, incompatible polymer addition in microcapsules preparation
Experiment No-2: Preparation and evaluation of Alginate beads
Experiment No-3: Formulation and evaluation of gelatin /albumin microspheres
Experiment No-4: Formulation and evaluation of liposomes/niosomes
Experiment No-5: Formulation and evaluation of spherules
Experiment No-6: Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
Experiment No-7: Comparison of dissolution of two different marketed products /brands.
Experiment No-8: Protein binding studies of a highly protein bound drug & poorly proteinbound drug.
Experiment No-9: Bioavailability studies of Paracetamol in animals.
Experiment No-10: Pharmacokinetic and IVIVC data analysis by Winnoline R software

Experiment No-11: <i>In vitro</i> cell studies for permeability and metabolism.
Experiment No-12: DoE Using Design Expert® Software
Experiment No-13: Formulation data analysis Using Design Expert® Software.
Experiment No-14: Quality-by-Design in Pharmaceutical Development.
Experiment No-15: . Computer Simulations in Pharmacokinetics and Pharmacodynamics
Experiment No-16: Computational Modeling of Drug Disposition.
Experiment No-17: To develop Clinical Data Collection manual.
Experiment No-18: To carry out Sensitivity Analysis, and Population Modeling.
Experiment No-19: Development and evaluation of Creams.
Experiment No-20: Development and evaluation of Shampoo and Toothpaste base.
Experiment No-21: To incorporate herbal and chemical actives to develop products.
Experiment No-22: To address Dry skin, acne, blemish, Wrinkles, bleeding gums and dandruff.



Vision: To be globally recognized for Physiotherapy education, interdisciplinary research and innovative therapeutic techniques for Rehabilitation.

Mission:

M1: Developing entrepreneurs in the healthcare domain.

M2: Collaborating with health care sector for development of curriculum, fundamentals and practical knowledge.

M3: Establishing centre of excellence in the field of evidence-based management and research.

Program Educational Objectives:

Graduate shall

PEO 1: engage in evidence-based treatment and collaborate with other professionals in multidisciplinary team.

PEO 2: take up higher education for career growth and research.

PEO 3: provide solutions for improving quality of life with effective physiotherapy rehabilitation.

Program Specific Objectives

Program Outcomes:

PO1: Physiotherapy Knowledge: Coursework entitles independent physiotherapy assessment and treatment in any healthcare delivery centers in India by the graduates

PO2: Problem Analysis: Evaluate patients for impairments and functional limitations and able to execute all routine physiotherapeutic procedures as per the evaluation

PO3: Design/development of solutions:The graduate shall utilize critical inquiry and evidence-based practice to make clinical decisions essential for autonomous practice

PO4:Leadership skills:The graduate shall demonstrate the leadership skills in performing societal and professional upliftment.

PO5: Professional Identity:Graduates can find employment opportunities in hospitals/nursing homes/sports teams/fitness centers/Community Rehabilitation /Health planning boards/health promotions services in both private and public sectors as well as in independent physiotherapy clinics

PO6: Physiotherapy and Society:The graduate shall function as an active member of professional and community organizations. The graduate will be a service-oriented advocate dedicated to the promotion and improvement of community health.

PO7: Basic Medical Knowledge: the graduates shall execute their basic medical knowledge in prevention, evaluation, treatment and rehabilitation of patient.

PO8: Ethics:The graduate shall be a competent and reflective physiotherapy practitioner who can function safely and effectively while adhering to legal, ethical and professional standards of practice in a multitude of physiotherapy settings for patients and clients across the lifespan and along the continuum of care from wellness and prevention to rehabilitation of dysfunction

PO9: Individual or Team work:The coursework is designed to train students to work as independent physiotherapists or in conjunction with a multidisciplinary team to diagnose and treat disorders as per the standard healthcare guidelines

PO10: Communication:Communicates and educates the individual's family, community, and other professionals about positive health, prevention, wellness, and rehabilitation.

PO11: Physiotherapy patient evaluation and management:Coursework shall skill the graduate's physical/functional diagnosis, treatment planning, management, administration of physiotherapy treatment and for patient support

PO12: Life-long learning: The graduate shall demonstrate lifelong commitment to learning and professional development.

Curriculum

Semester 1									
S.No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BPHY1001	Human Anatomy – I	4	0	0	4	10	20	70
2	BPHY1002	Human Physiology -I	4	0	0	4	10	20	70
3	BPHY1003	Biochemistry	3	0	0	3	10	20	70
4	BPHY1004	Sociology	2	0	0	2	10	20	70
5	BPHY1005	Introduction to Health care Delivery System in India	2	0	0	2	50		
6	BPHY1006	Basic computer and information science	1	0	0	1	50		
8	BPHY1007	Introduction to Yoga- Basic theory, science and techniques	1	0	0	1	50		
9	BPHY1008	Community orientation and clinical visit (Project)	0	0	2	1	50		
10	BPHY1009	Human Anatomy – I(Lab)	0	0	5	2.5	10	20	70
11	BPHY1010	Human Physiology -I(Lab)	0	0	2	1	10	20	70
12	BPHY1011	Biochemistry (Lab)	0	0	1	0.5	10	20	70
13	BPHY1012	Basic computer and information science (Lab)	0	0	2	1	50		
14	BLLUCT1001	Communication skills by Cambridge (BEC 1)	0	0	6	3			
15	BPHY1013	Introduction to Yoga- Basic theory, science and techniques (Lab)	0	0	2	1	50		
		Total	19	0	20	29			
Semester II									
S.No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BPHY2001	Human Anatomy – II	4	0	0	4	10	20	70
2	BPHY2002	Human Physiology – II	4	0	0	4	10	20	70
3	BPHY2003	General and Clinical Psychology	3	0	0	3	10	20	70
4	BPHY2004	Basic principles of Biomechanics	3	0	0	3	10	20	70
5	BPHY2005	Medical terminology and record keeping	2	0	0	2	50		
6	BPHY2006	Human Anatomy – II(Lab)	0	0	6	3	10	20	70
7	BPHY2007	Human Physiology – II(Lab)	0	0	3	1.5	10	20	70
8	BPHY2008	General and Clinical Psychology (Lab)	0	0	1	0.5	10	20	70
9	BPHY2009	Basic principles of Biomechanics (Lab)	0	0	2	1	10	20	70
10	BLEUCT1001	Foreign Language (Prescribed by university)	2	0	0	2			

11	BPHY2010	Clinical observation (Project)	0	0	5	2.5	50		
		Total	18	0	17	26.5			
Semester III									
S.No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BPHY3001	Pathology	3	0	0	3	10	20	70
2	BPHY3002	Microbiology	3	0	0	3	10	20	70
3	BPHY3003	Pharmacology	3	0	0	3	10	20	70
4	BPHY3004	Biomechanics and kinesiology	5	0	0	5	10	20	70
5	BPHY3005	Foundation of Exercise Therapy and therapeutic massage	3	0	0	3	10	20	70
6	BPHY3006	Introduction to quality and patient safety (Including Emergency care, BLS, Biomedical waste management, Infection prevention and control, etc.)	1	0	0	1	50		
7	BPHY3007	Pathology (Lab)	0	0	1	0.5	10	20	70
8	BPHY3008	Microbiology (Lab)	0	0	1	0.5	10	20	70
9	BPHY3009	Biomechanics and kinesiology (Lab)	0	0	5	2.5	10	20	70
10	BPHY3010	Foundation of Exercise Therapy and therapeutic massage (Lab)	0	0	4	2	10	20	70
11	BPHY3011	Introduction to quality and patient safety (Including Emergency care, BLS, Biomedical waste management, Infection prevention and control, etc.) (Lab)	0	0	2	1	50		
12	BLEUCT1002	Liberal Arts	0	0	1	0.5	Activity based assessment		
13	BPHY3012	Clinical observation (Project)	0	0	5	2.5	50		
		Total	18	0	19	27.5			
Semester IV									
S.No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BPHY4001	Exercise Therapy	5	0	0	5	10	20	70

2	BPHY4002	Bio physics	1	0	0	1	10	20	70
3	BPHY4003	Electrotherapy (LMHF & Equipment care)	5	0	0	5	10	20	70
4	BPHY4004	Exercise Therapy (Lab)	0	0	7	3.5	10	20	70
5	BPHY4005	Bio physics (Lab)	0	0	2	1	10	20	70
6	BPHY4006	Electrotherapy (LMHF & Equipment care) (Lab)	0	0	8	4	10	20	70
7	BPHY4007	Medical/ Physiotherapy Law and Ethics	2	0	0	2	50		
8	BPHY4008	Clinical Education	0	0	6	3	50		
9	BCEUCT1001	Energy and Environmental Sciences	0	0	1	0.5	Works hop mode 8-10 hours		
		Total	13	0	25	25			

Semester V

S.No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BPHY5001	Clinical Orthopedics & Traumatology	4	0	0	4	10	20	70
2	BPHY5002	General Surgery including burns and plastic surgery & Obstetrics and Gynecology	4	0	0	4	10	20	70
3	BPHY5003	General Medicine, Pediatrics & psychiatry	4	0	0	4	10	20	70
4	BPHY5004	Community Medicine	4	0	0	4	10	20	70
5	BPHY5005	Evaluation Methods & Outcome Measures	2	0	0	2	50		
6	BPHY5006	Diagnostic imaging for Physiotherapist	1	0	0	1	50		
7	BPHY5007	General Surgery including burns and plastic surgery & Obstetrics and Gynecology (Lab)	0	0	1	0.5	10	20	70
8	BPHY5008	General Medicine, Pediatrics & psychiatry (Lab)	0	0	1	0.5	10	20	70
9	BPHY5009	Evaluation Methods & Outcome Measures (Lab)	0	0	2	1	50		
10	BPHY5010	Clinical education	0	0	13	7.5	50		
11	BLLUCT1003	Campus to corporate	3	0	0	3			

		Total	22	0	17	31	.5			
Semester VI										
S.No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	MTE	ETE	
1	BPHY6001	Physiotherapy in Orthopedics & sports	4	0	0	4	10	20	30	
2	BPHY6002	Physiotherapy In General Medicine and General surgery	4	0	0	4	10	20	30	
3	BPHY6003	Clinical Neurology & Neurosurgery	3	0	0	3	10	20	30	
4	BPHY6004	Professionalism and values	1	0	0	1	50			
5	BPHY6005	Physiotherapy in Orthopedics & sports(Lab)	0	0	5	2.5	10	20	70	
6	BPHY6006	Physiotherapy in General Medicine and General surgery (Lab)	0	0	5	2.5	10	20	70	
7	BPHY6007	Clinical Neurology & Neurosurgery (Lab)	0	0	1	0.5	10	20	70	
8	BPHY6008	Clinical education (Project)	0	0	13	7.5	50			
9	BLEUCT1003	Creativity, Innovation and Entrepreneurship & IPR – 1 Credit	1	0	0	1				
		Total	13	0	24	26				
Semester VII										
S.No	Course Code	Name of the Course					Assessment Pattern			
			L	T	P	C	IA	MTE	ETE	
1	BPHY7001	Physiotherapy in Neurology & psychosomatic disorder	4	0	0	4	10	20	70	
2	BPHY7002	Biostatistics & Research Methodology	4	0	0	4	10	20	70	
3	BPHY7003	Health Promotion and Fitness	1	0	0	1	10	20	70	
4	BPHY7004	Clinical cardiovascular & pulmonary	4	0	0	4	10	20	70	
5	BPHY7005	Principles of Management	2	0	0	2	50			
6	BPHY7006	Physiotherapy in Neurology & psychosomatic disorder (Lab)	0	0	5	2.5	10	20	70	
7	BPHY7007	Health Promotion and Fitness (Lab)	0	0	2	1	10	20	70	
8	BPHY7008	Clinical education (Project)	0	0	13	7.5	50			
9	BPHY7009	Critique inquiry, case presentation and discussion (Lab)	0	0	1	0.5	50			
10	BCSUCT1001	AI and its Applications	0	0	4	2				
		Total	15	0	25	28	.5			
Semester VIII										

Detailed Syllabus

School of Medical and Allied Sciences

Name of The Course	Human Anatomy-I			
Course Code	BPTHY1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

- To learn and understand the anatomical terminology in practice of physiotherapy.
- To interpret the gross and fine structure of human body.
- To interpret the anatomy of different organs associated to different organ systems.
- To understand and interpret the knowledge of the structure of different glands

Course Outcomes

CO1	To use and learn terminology and language associated with histology
CO2	To use and learn terminology and language associated with embryology
CO3	To interpret the structure of various systems of the Human Body- especially system, Cardio-vascular and respiratory system
CO4	To interpret the structure of visceral organs of the human body
CO5	To study and interpret the endocrine system of the body
CO6	To imagine and predict surface anatomy of thorax , abdomen and pelvis.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I:General Anatomy-I	12 Hours
<p>General Anatomy .Anatomical positions of body, Common anatomical terminologies</p> <p>Bones- Composition, functions, classification and types according to morphology and development.</p> <p>Joints-definition-classification, structure of fibrous, cartilaginous joints, blood supply and nerve supply of joints.</p> <ul style="list-style-type: none"> Histology:General Histology, study of the basic tissues of the body; Microscope, Cell, Epithelium, Connective Tissue, Cartilage, Bone, 	

- Muscular tissue,
- Nerve Tissue – TS & LS,
- Circulatory system – large sized artery, medium sized artery, large sized vein, lymphoid tissue, Skin and its appendages.

Unit II:General Anatomy-II 10 Hours

- Ovum, Spermatozoa, fertilization and formation of the Germ layers and their derivations.
- Development of skin, Fascia, blood vessels, lymphatic,
- Development of bones, axial and appendicular skeleton and muscles,
- Neural tube, brain vessels and spinal cord,
- Development of brain and brain stem structures

Unit III: Regional Anatomy: Thorax 10 Hours

- Cardio – Vascular System Mediastinum: Divisions and contents Pericardium:
- Thoracic Wall: position, shape and parts of the heart; conducting System; blood Supply and nerve supply of the heart; names of the blood vessels and their distribution in the body – region wise.
- Respiratory system - Outline of respiratory passages: Pleura and lungs: position, parts, relations, blood supply and nerve supply; Lungs – emphasize on bronchopulmonary segments.
- Diaphragm: Origin, insertion, nerve supply and action, openings in the diaphragm.
- Intercostal muscles and Accessory muscles of respiration: Origin, insertion, nerve supply and action.

Unit IV:Abdomen and Pelvis 10 Hours

- Peritoneum: Parietal peritoneum, visceral peritoneum, folds of peritoneum, functions of peritoneum.
- Large blood vessels of the gut.
- Location, size, shape, features, blood supply,
- Nerve supply and functions of the following: stomach, liver, spleen, pancreas, kidney, urinary bladder, intestines, gall bladder.
- Pelvis: Position, shape, size, features,
- Blood supply and nerve supply of the male and female reproductive system.

Unit V: Endocrine Glands 10 Hours

- Endocrine glands: Position, shape, size, function,

<ul style="list-style-type: none"> • blood supply and nerve supply of the following glands: • Hypothalamus and pituitary gland, • thyroid glands, • parathyroid glands, • Adrenal glands, • Pancreatic islets, ovaries and testes, pineal glands, thymus. 	
Unit VI: Surface anatomy	8
hours	
<ul style="list-style-type: none"> • Thorax • Abdomen and pelvis 	

Name of The Course	Human Physiology -I			
Course Code	BPHY1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

1. The physiological functions of the systems of Human body with special emphasis on nerve- muscle, blood, cardiovascular, respiratory, digestive and endocrine system.
2. The physiological applied principles in the practice of physical therapy.
3. The **metabolic pathways**

Course Outcomes

CO1	Illustrate general and nerve muscle physiology.
CO2	Illustrate and identify the normal blood and cardiovascular physiology.
CO3	Demonstrate the respiratory physiology.
CO4	To utilize their knowledge for identification of pathological events occurring in the digestive system.
CO5	To interpret the common pathophysiology of the reproductive endocrine systems in an individual.
CO6	To develop knowledge of applied physiology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: General and Nerve Muscle Physiology	10 hours
<ul style="list-style-type: none"> ❖ Cell: Morphology. Organelles: their structure and functions ❖ Transport Mechanisms across the cell membrane ❖ Body fluids: Distribution, composition. <p>Nerve Muscle Physiology</p> <ul style="list-style-type: none"> ❖ Introduction: Resting membrane potential. Action potential – ionic basis and properties. ❖ Nerve: Structure and functions of neurons. Classification, Properties and impulse transmission of nerve fibres. Nerve injury – degeneration and regeneration. 	

Suggested Reading

1. B.D. Chaurasia's Handbook of General Anatomy 4th edition, CBS Publishers & distributors, 2013, ISBN: 978-8123916545
2. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Upper limb & Thorax (volume-1) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1155-6
3. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Lower limb Abdomen and Pelvis (volume-2) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1156-4
4. H.McMinn, John Pegington, Peter H. Abrahams. A Color Atlas of Human Anatomy 3rd edition, M, Mosby, 1996, ISBN: 978-0815158585
5. Richard S. Snell. Clinical Anatomy for Medical Students 6th edition, Lippincott Williams & Wilkins, 2000, ISBN: 9780781715744
6. Derek Field. Field's Anatomy, Palpation and Surface Marking 4th edition, Butterworth-Heinemann Ltd, 2006, ISBN: 978-0750688482

<ul style="list-style-type: none"> ❖ Neuroglia: Types and functions. ❖ Muscle: Classification. Skeletal muscle: Structure. Neuromuscular junction: Structure. Neuromuscular transmission, myasthenia gravis. Excitation- Contraction coupling. Rigor mortis. 	
Unit II: Blood and Cardiovascular System	12
hours	
<ul style="list-style-type: none"> ❖ Introduction: Composition and functions of blood. ❖ Plasma: Composition, formation, functions. Plasma proteins. ❖ RBC: count and its variations. Erythropoiesis- stages, factors regulating Reticuloendothelial system (in brief) Haemoglobin –structure, function and derivatives Anemia (in detail), types of Jaundice. Blood indices, PCV, ESR. ❖ WBC: Classification. Morphology, functions, count, its variation of each. Immunity ❖ Platelets: Morphology, functions, count, its variations ❖ Hemostatic mechanisms: Blood coagulation–factors, mechanisms. Their disorders. Anticoagulants. ❖ Blood Groups: Landsteiner’s law. Types, significance, determination, Erythroblastosis foetalis. ❖ Blood Transfusion: Cross matching. Indications and complications. ❖ Lymph: Composition, formation, circulation and functions. <p>Cardiovascular System</p> <ul style="list-style-type: none"> ❖ Introduction: Physiological anatomy and nerve supply of the heart and blood vessels. Organisation of CVS. Cardiac muscles: Structure. Ionic basis of action potential and pacemaker potential. Properties. ❖ Conducting system: Components. Impulse conduction Cardiac Cycle: Definition. Phases of cardiac cycle. Pressure and volume curves. Heart sounds – causes, character. ECG: Definition. Different types of leads. Waves and their causes. P-R interval. Heart block. ❖ Cardiac Output: Definition. Normal value. Determinants. Stroke volume and its regulation. Heart rate and its regulation. Their variations ❖ Arterial Blood Pressure: Definition. Normal values and its variations. Determinants. Peripheral resistance. Regulation of BP. <ul style="list-style-type: none"> • Arterial pulse. • Shock – Definition. Classification–causes and features • Regional Circulation: Coronary, Cerebral and Cutaneous circulation. • Cardiovascular changes during exercise. 	
Unit III: Respiratory System	10 hours

Respiratory System –	
<ul style="list-style-type: none"> ❖ Introduction: Physiological anatomy – Pleura, tracheo-bronchial tree, alveolus, respiratory membrane and their nerve supply. Functions of respiratory system. Respiratory muscles. ❖ Mechanics of breathing: Intrapleural and Intrapulmonary pressure changes during respiration. Chest expansion. Lung compliance: Normal value, pressure-volume curve, factors affecting compliance and its variations. Surfactant – Composition, production, functions. RDS ❖ Spirometry: Lung volumes and capacities. Timed vital capacity and its clinical significance. Maximum ventilation volume. Respiratory minute volume. ❖ Dead Space: Types and their definition. ❖ Pulmonary Circulation. Ventilation-perfusion ratio and its importance. ❖ Transport of respiratory gases: Diffusion across the respiratory membrane. Oxygen transport – Different forms, oxygen-haemoglobin dissociation curve. Factors affecting it. P50, Haldane and Bohr effect. Carbon dioxide transport: Different forms, chloride shift. ❖ Regulation of Respiration: Neural Regulation. Hering-breuer’s reflex. Voluntary control. ❖ Chemical Regulation. ❖ Hypoxia: Effects of hypoxia. Types of hypoxia. Hyperbaric oxygen therapy. Acclimatization Hypercapnoea. Asphyxia. Cyanosis – types and features. Dysbarism ❖ Disorders of Respiration: Dyspnoea. Orthopnoea. Hyperpnoea, hyperventilation, apnoea, tachypnoea. periodic breathing – types Artificial respiration ❖ Respiratory changes during exercise. 	
Unit IV: Digestive System	10 hours
<ul style="list-style-type: none"> ❖ Introduction: Physiological anatomy and nerve supply of alimentary canal. Enteric nervous system ❖ Salivary Secretion: Saliva: Composition. Functions. Regulation. Mastication (in brief) ❖ Swallowing: Definition. Different stages. Function. ❖ Stomach: Functions. Gastric juice: Gland, composition, function, regulation. Gastrin: Production, function and regulation. Peptic ulcer. Gastric motility. Gastric emptying. Vomiting. ❖ Pancreatic Secretion: Composition, production, function. Regulation. ❖ Liver: Functions of liver. Bile secretion: Composition, functions and regulation. Gall bladder: Functions. ❖ Intestine: Succus entericus: Composition, function and regulation of secretion. Intestinal motility and its function and regulation. ❖ Mechanism of Defecation 	
Unit-V: Endocrine System	10
hours	
<ul style="list-style-type: none"> ❖ Introduction: Major endocrine glands. Hormone: classification, mechanism of action. Functions of hormones ❖ Pituitary Gland: Anterior Pituitary and Posterior Pituitary hormones: Secretory cells, action on target cells, regulation of secretion of each hormone. Disorders: Gigantism, 	

<p>Acromegaly, Dwarfism, Diabetes insipidus. Physiology of growth and development: hormonal and other influences.</p> <ul style="list-style-type: none"> ❖ Pituitary-Hypothalamic Relationship. ❖ Thyroid Gland: Thyroid hormone and calcitonin: secretory cells, synthesis, storage, action and regulation of secretion. Disorders: Myxedema, Cretinism, Grave's disease. ❖ Parathyroid hormones: secretory cell, action, regulation of secretion. Disorders: Hypoparathyroidism. Hyperthyroidism. Calcium metabolism and its regulation. ❖ Adrenal Gland: Adrenal Cortex: Secretory cells, synthesis, action, regulation of secretion of Aldosterone, Cortisol, and Androgens. Disorders: Addison's disease, Cushing's syndrome, Conn's syndrome, Adrenogenital syndrome. ❖ Adrenal Medulla: Secretory cells, action, regulation of secretion of adrenaline and noradrenaline. Disorders: Pheochromocytoma. ❖ Endocrine Pancreas: Secretory cells, action, regulation of secretion of insulin and glucagon. Glucose metabolism and its regulation. Disorder: Diabetes mellitus. ❖ Calcitriol, Thymus and Pineal gland (very brief). ❖ Local Hormones. (Briefly)

Unit VI: Applied Physiology **8**
hours

Nervous system

- ❖ Muscles and Nervous System Functions
- ❖ Neuromuscular transmission, Types of nerve fibers. Action potential, Strength-duration curve, ECG, EMG, VEP, NCV
- ❖ Degeneration and regeneration of nerve, Reactions of denervation.

Blood functions

- ❖ Thalassemia Syndrome, Hemophilia, VWF
- ❖ Anemia, Leukocytosis
- ❖ Bone marrow transplant
- ❖ Cardio vascular Functions: Blood flow through arteries, arterioles, capillaries, veins and venuoles.
- ❖ Circulation of Lymph, Oedema
- ❖ Factors affecting cardiac output.
- ❖ Circulatory adjustment in exercise and in postural and gravitational changes,
- ❖ Pathophysiology of fainting and heart failure.

Pulmonary Functions

- ❖ Properties of gases, Mechanics of respiration, Diffusion capacity, special features of pulmonary circulation and their application.
- ❖ Respiratory adjustments in exercises.
- ❖ Artificial respiration
- ❖ Breath sounds.

Digestive system

- ❖ Physiological basis of Peptic Ulcer, Jaundice, GIT disorders and Dietary fibers.

1. Dr. A. K. Jain. Textbook of Physiology (Set of 2 Volumes) 5th Edition, Avichal Publishing Company, ISBN: 9788177393583
2. Dr. A. K. Jain. Manual Of Practical Physiology For Mbbs 4th edition, Avichal Publishing Company, ISBN: 9788178553153
3. A.C.Guyton, J.E. Hall. Textbook of Medical Physiology 11th edition, Elsevier Saunders, 2006, ISBN: 9780721602400
4. R. L. Bijlani, S. Manjunatha. Understanding Medical Physiology: A textbook for Medical Students 4th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2011, ISBN: 978-80704-81-4

Name of The Course	BIOCHEMISTRY			
Course Code	BPHY1003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

To study:

- The Clinical Biochemistry
- **The various metabolic pathways**
- **The basic knowledge and requirements of vitamins, minerals and nutrition.**

Course Outcomes

CO1	To understand the clinical biochemistry.
CO2	To understand the importance of nutrition
CO3	To know the structure of electrolytes, acid base balance and water in the human body.
CO4	To have general understanding of the major types of biochemical molecules, including small, large and super-molecular components found in cells.
CO5	To have firm foundations about the fundamentals of vitamins, hormone, cell and molecular biology.

Suggested Reading

CO6	To develop understanding of recent advances in biochemistry
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Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to Biochemistry

7 Hours

- ❖ **Biochemistry of Connective tissue**
 - Introduction
 - connective tissue proteins: Collagen, elastin
 - Structure and associated disorders
 - Glycoproteins
 - Proteoglycans.
- ❖ **Muscle Contraction -**
 - Contractile elements in muscle
 - Process of muscle contraction
 - Energy for muscle contraction.
- ❖ **Clinical Biochemistry –**
 - Normal levels of blood and urine constituents, Relevance of blood and urine levels of Glucose, Urea, Uric acid, Creatinine, Calcium, Phosphates, pH and Bicarbonate. Liver function tests, Renal function tests.

Unit II: Introduction to Nutrition

9 Hours

- ❖ **Nutrition –**
 - Introduction, Importance of nutrition Calorific values, Respiratory quotient – Definition, and its significance
 - Energy requirement of a person - Basal metabolic rate: Definition, Normal values, factor affecting BMR
 - Special dynamic action of food.
 - Physical activities - Energy expenditure for various activities. Calculation of energy requirement of a person
 - Balanced diet
- Recommended dietary allowances
- Role of carbohydrates in diet: Digestible carbohydrates and dietary fibers
- Role of lipids in diet
- Role of proteins in diet: Quality of proteins - Biological value, net protein utilization, Nutritional aspects of

proteins-essential and non- essential amino acids. Nitrogen balance

-Nutritional disorders.

- ❖ **Carbohydrate Chemistry –**
 - Definition, general classification with examples, Glycosidic bond
 - Structures, composition, sources, properties and functions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides.
 - Glycosaminoglycan (mucopolysaccharides)
- ❖ **Lipid Chemistry –**
 - Definition, general classification
 - Definition, classification, properties and functions of Fatty acids, Triacylglycerol, Phospholipids, Cholesterol
 - Essential fatty acids and their importance
 - Lipoproteins: Definition, classification, properties, Sources and function Ketone bodies
- ❖ **Amino-acid Chemistry –**
 - Amino acid chemistry: Definition, Classification, Peptide bonds
 - Peptides: Definition, Biologically important peptides
 - Protein chemistry: Definition, Classification, Functions of proteins,
- ❖ **Nucleotide and Nucleic acid Chemistry –**
 - Nucleotide chemistry: Nucleotide composition, functions of free nucleotides in body.
 - Nucleic acid (DNA and RNA) chemistry: Difference between DNA and RNA, Structure of DNA (Watson and Crick model), Functions of DNA. Structure and functions of tRNA, rRNA, mRNA.

Unit III: Introduction to Electrolyte Balance & Enzyme

7 Hours

- ❖ **Electrolyte balance –**
 - Osmolarity. Distribution of electrolytes.
 - Electrolyte balance: Role of aldosterone, rennin angiotensin system and ANF.
- ❖ **Acid-Base balance –**
 - Acids, bases and buffers, pH. Buffer systems of the body, bicarbonate buffer system Role of lungs and kidneys in acid base balance, Acid base imbalance.
- ❖ **Water balance –**
 - Water distribution in the body, Body water, water turnover, Regulation of water balance: role of ADH and thirst Centre.
- ❖ **Enzymes –**
 - Definition, Active site, Cofactor (Coenzyme, Activator), Proenzyme. Classification with example, Factors effecting enzyme activity, Enzyme inhibition and significance, Isoenzymes, Diagnostic enzymology (clinical significance of enzymes)

Unit IV: Introduction to Metabolism**9 Hours:**

- ❖ **Lipid Metabolism –**
Introduction to lipid metabolism, Lipolysis, Oxidation of fatty acids -oxidation of fatty acids
 - Lipogenesis - Denovo synthesis of fatty acids, chain elongation, desaturation, triacylglycerol synthesis, fat metabolism in adipose tissues
 - Ketone body metabolism: Ketone body formation (ketogenesis), utilization (ketolysis), ketosis, Rothera's test.
 - Cholesterol metabolism: synthesis, degradation, cholesterol transport e. Hypercholesterolemia and its effects (atherosclerosis and coronary heart diseases) Hypocholesterolemic agents, Common hyperlipoproteinemia, Fatty liver
- ❖ **Carbohydrate Metabolism –**
 - Introduction, Glycolysis – Aerobic, Anaerobic Citric acid cycle, Substrate level phosphorylation.
 - Glycogen metabolism – Glycogenesis, Glycogenolysis, Metabolic disorders glycogen, Gluconeogenesis, Cori cycle
 - Hormonal regulation of glucose, Glycosuria, Diabetes mellitus.
 - Amino acid and Protein Metabolism - a. Catabolism of amino acids - Introduction, transamination, deamination, Fate of ammonia, transport of ammonia, Urea cycle b. Specialized products formed from amino acids - from glycine, arginine, methionine, phenylalanine and tyrosine.
- ❖ **Mineral Metabolism-**
 - Definition, Sources, RDA, Digestion, absorption, transport, excretion, functions, disorder of Individual minerals - Calcium, phosphate, iron, Magnesium, fluoride, selenium, molybdenum, copper. Phosphate, calcium and iron in detail.

Unit V: Introduction to Vitamins, Hormone & Cell Biology**9 Hours**

- ❖ **Vitamins -**
 - Definition, classification according to solubility, b. Individual vitamins - Sources, Coenzyme forms, functions, RDA, digestion, absorption and transport, deficiency and toxicity.
- ❖ **Hormone Action –**
 - Definition, classification, Mechanism of hormone action. Receptors, signal transduction, second messengers and cell function.

❖ **Cell Biology –**

- Introduction, Cell structure, Cell membrane structure and function, various types of absorption. Intracellular organelles and their functions, briefly on cytoskeleton.

Unit VI: Recent advances in Biochemistry
8 Lectures

- ❖ **Keto diet and its dietary allowance.**
- ❖ **Recent advances in segregation of proteins, fats, etc.**
- ❖ **Biotechnology and its role in research**
- ❖ **Bioinformatics and its role in research**

Suggested Reading

- **Textbook of Medical Biochemistry –Chatterjee and Shinde**
- **T.B of Biochemistry for medical students-Vasudevan D.M-Jaypee Bros.10th edition**
- **T.B of Biochemistry-Chatterjee M.N- Jaypee Bros 6th edition**
- **Clinical Biochemistry-Metabolic &Clinical Aspects-Marshall & Bangart-Churchill Livingstone.**
- **M.N. Chatterjea, Rana Shinde. Text Book of Medical Biochemistry 7th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2007, ISBN: 9788184481341**
- **Robert K. Murray, Darryl K. Granner, Peter A. Mayes, Victor W. Rodwell,Harper's Illustrated Biochemistry 26th edition. Mcgraw-hill, 2003, ISBN: 9780071389**
- **Lehninger Principle of Biochemistry 5th edition, David L Nelson, Michael M Cox, W. H. Freeman publishers, 2008, ISBN: 978-0716771081**
- **Biochemistry Southerland-Churchill Livingstone**

CO3	To understand the influence of society and social changes on the health and its rehabilitation
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Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Contents:

Unit I: Introduction to sociology 10 hours	
❖	Meaning-Definition and scope of Sociology
❖	Methods of Sociological investigations- Case study, social survey, questionnaire, Interview and opinion poll methods.
❖	Importance of its study with special reference to health care professionals.
❖	Social Factors in Health and Disease-Meaning & Role
❖	Concept of Health, Concept of Culture
❖	Culture and Health, Culture and Health Disorders
Unit II Family & Community 10 hours	
❖	Family-Meaning, definition and Functions, Changing family Patterns
❖	Influence of family on the individual health, family and nutrition. The effects of sickness on family and psychosomatic disease and their importance to Physiotherapy.
❖	Community Rural & Urban Community-Meaning and features-Health hazards of both
Unit III: Social problems, change & security 10 hours	
Consequences of the following social problems in relation to sickness and Disability, remedies to prevent these problems.	
❖	Population explosion
❖	Poverty and unemployment
❖	Beggary
❖	Juvenile delinquency, geriatric problems.
❖	Prostitution
❖	Alcoholism
❖	Problems of women in employment, Social change: Meaning, Factors of social changes.

Name of The Course	SOCIOLOGY			
Course Code	BPHY1004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives

To study

1. the basic sociology concepts, principles and social process
2. social institutions in relation to the individual, family and community
3. the various social factors affecting the family in rural and urban communities in India.

Course Outcomes

CO1	To apply the principles of sociology for understanding the disease process and formulating a holistic treatment for the patients.
CO2	To understand the importance of the status of a person in society for his physical, mental and social health and the influence of the environment and emotions of the health of a person.

- ❖ Human adaptation and social change, Social change and stress.
- ❖ Social change and deviance, Social change and health programme
- ❖ The role of social planning in the improvement of health and rehabilitation.
- ❖ Social security and social legislation in relation to the Disabled.
- ❖ Social worker- Meaning of social work; the role of a medical social worker.

CO1	To understand the importance of Health care delivery system & National health Program.
CO2	To understand the need for integration of various system of medicine.
CO3	To understand the importance of knowledge of Demography & Epidemiology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	-	-	50

Course Content:

<p>Unit I: Introduction to Healthcare delivery system & National Health Program</p> <p style="text-align: center;">10 Hours</p> <ul style="list-style-type: none"> • Healthcare delivery system in India at primary, secondary and tertiary care • Community participation in healthcare delivery system • Health system in developed countries. • Private Sector • National Health Mission • National Health Policy • Issues in Health Care Delivery System in India • Background objectives, action plan, targets, operations, achievements and constraints Various National Health Programme. • Health scenario of India- past, present and future
<p>Unit II: Introduction to AYUSH system of Medicine</p> <p>10 Hours</p> <p>Introduction to</p> <ul style="list-style-type: none"> • Ayurveda. • Naturopathy • Unani • Siddha • Homeopathy <p>Need for integration of various system of medicine.</p>
<p>Unit III: Demography & Epidemiology</p> <p>10 Hours:</p> <ul style="list-style-type: none"> • Demography – its concept • Vital events of life & its impact on demography • Significance and recording of vital statistics

Suggested Reading

- Introduction to Sociology, Vidhya Bhushan, D.R. Sachdeva, Kitab Mahal Publishers, 2005, ISBN: 9788122501070
- The Structure of Sociological Theory 1st edition, J. H. Turner, Dorsey publisher, 1974, ASIN: B0039BDDEM
- Nation Building in India: culture, power & Society, Anand Kumar, Radiant publishers, 1999, ISBN: 9788170272281
- Social Psychology 12th edition, Robert A. Baron, Nyla R. Branscombe, Donn Byrne, Allyn & Bacon publishers, 2008, ISBN : 978-0205581498

Name of The Course	Introduction of Health Delivery System in India			
Course Code	BPPTHY1005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. To Study the National Health Policy, National health Program. and process a holistic treatment for the patients.
2. To Study the need for integration of various system of medicine.
3. To Study the Significance and impact of vital statistics on health Policy.

Course Outcomes

- Census & its impact on health policy.
- Principles of Epidemiology
- Natural History of disease

Suggested Reading

- IAPSM’s textbook of Community Medicine, by A. M. Kadri.
- Healthcare Systems Brandon Popet, Maethee Mekaroonreung Amarnath Banerje and Andrew L. Johnson
- Latest In health care management by pradeep Bhardwaj
- Step by step quality hospital care by farooq jan

Name of The Course	BASIC COMPUTERS AND INFORMATION SCIENCE			
Course Code	BPTHY1006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

1. Computer technology.
2. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

Course Outcomes

CO1	To know basic of computers
CO2	To apply the knowledge of operating system, networks & its application

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit I: Introduction to Computers	7 hours
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- Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
- Input output devices: Input devices (keyboard, p oint and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
- Processor and memory: The Central Processing Unit (CPU), main memory.
- Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
- Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).
- Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge

Unit II: Introduction to Excel & power-point 8 Hours

- Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
- Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system.
- Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
- Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, th World Wide Web (WWW)), www browsers, use of the internet. a. Application of Computers in clinical

Suggested Reading

- Introduction to Computers by Dr Darrell W Hajek
- (Lecture Notes in Computer Science 1491) W. Reisigs, G. Rozenberg (auth.), Wolfgang Reisig, GrzegorzRozenberg (eds.) - Lectures on Petri Nets I_ Basic Models_ Advances in Petri Nets-Springer-VerlagB.djvu

- Introduction to Computer Systems for Health Information Technology by Nanette B Sayles

Name of The Course	Introduction to Yoga- Basic theory, science and techniques			
Course Code	BPHY1007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

- The principles of yoga techniques e.g. asana, meditation ,relaxation, stretching, strengthening
- To understand the basic science

Course Outcomes

CO1	Illustrate the foundations of yoga and health
CO2	Interpret asanas according to standing position.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50			50

Course Content:

Unit-1: Foundation of Yoga and health	8
hours	
<ul style="list-style-type: none"> • Introduction to Yoga and its philosophy • Brief history, development of Yoga • Philosophical foundations of Yoga • Streams & types of Yoga 	
Name of The Course	Community orientation and clinical visit (Project)
Course Code	BPHY1008
Prerequisite	
Corequisite	
Antirequisite	
	0 0 2 1

Course Objectives:

<ul style="list-style-type: none"> • Concept of body in yoga – Panchakosha theory • Concept of Health and Disease in yoga • Stress management through yoga • d. Disease prevention and promotion of positive health through yoga 	
UNIT-II: Asnas in standing posture	7
hours	
<ul style="list-style-type: none"> • Tadasana (Upward stretch posture) • Ardha Chakrasana (Half wheel posture) • Ardha Katicakrasana (Half lumber wheel posture) • Utkatasana (Chair posture) • Pada Hastasana (Hand to toes posture) • Trikonasana (Triangle posture) 	
<ul style="list-style-type: none"> • Parshva Konasana (Side angle posture) • Garudasana (Eagle posture) 	
Vrikshasana (Tree posture)	

Suggested Reading

- Swami SatyanandaSaraswati, "Asana, Pranayama, MudraBandha", Yoga Publication Trust, Thomson Press(India) Limited, 2013, ISBN: 978-81-86336-14-4
- Swami Muktibodhananda, "Hatha Yoga Pradipika", Yoga Publication Trust, Yoga Publication Trust, Thomson Press(India) Limited, 2012, ISBN:978-81-85787-38-1
- Dr Swami Karmnanda, "Yogic Management of Common Diseases", Yoga Publication Trust, Yoga Publication Trust, Thomson Press(India) Limited, 2013, ISBN: 978-81-85787-24-4
- Dr. K. Ramesh Babu, "Asana Sutras", Home of Yoga Publication, Vizinagam
- Swami Prabhavananda "Patanjali Yoga Sutras", Sri Ramakrishna Math, Chennai, ISBN: 81-7823-108-5

1. To understand the community orientation programmes, Models of CBR.
2. To apply knowledge of physiotherapy during the clinical visits & health camps

Course Outcomes

CO1	To understand the community orientation
CO2	To apply knowledge during the clinical visits & health camps

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Contents:

List of Practicals	15 hours
1. Introduction to institution, Role of physiotherapist in society 2. First aid, BLS 3. National health goals and policies 4. Interactions with patients, family and communities. 5. concept of professionalism and ethics 6. understanding of role of physiotherapist in multidisciplinary team. 7. Immunization requirements of healthcare professionals. 8. Basic life support in skill labs. 9. personal hygiene and its importance. 10. COVID-19 community spread.	

Suggested Readings:

- Foundation of Community Medicine. CM Dhaar, Rubbani
- Community Medicine (With Recent Advances) by Suryakantha AH, Jaypee Publications
- A Comprehensive textbook of Community Medicine, Mathur

Principles & Practice of Community Medicine, Asma Rahim, Jaypee Publications

Name of The Course	HUMAN ANATOMY LAB			
Course Code	BPHY1009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	5	2.5

Course Objectives

1. To learn and understand the anatomical terminology in practice of physiotherapy.
2. To interpret the gross and fine structure of human body.
3. To interpret the anatomy of different organs associated to different organ systems.

Course Outcomes

CO1	To learn terminology and histology of structures associated with bones of human body
CO2	To learn terminology and histology of structures associated with Joints of human body
CO3	To interpret the structural anatomy and muscle associated with the structure in Thorax
CO4	To interpret the structural anatomy and muscle associated with the structure in Abdominal cavity
CO5	To interpret the structural anatomy and muscle associated with the structure in human reproductive system

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30	00	70	100

List of Practical

75 hours

Practical 1	To study about the movements at different joints of human body.
Practical 2	To study about the Joint Classification.
Practical 3	To study about surface marking of Thorax and muscles associated to thorax.
Practical 4	To study about surface anatomy of respiratory system by specimen, models and charts.
Practical 5	To study about surface anatomy of cardio vascular system by specimen, models and charts.
Practical 6	To study about surface marking of Abdominal cavity and muscles associated to abdomen.
Practical 7	To study about surface anatomy of digestive system by specimen, models and charts.
Practical 8	To study about surface anatomy of urinary system by specimen, models and charts.

Practical 9	To study about surface anatomy of Male reproductive system by specimen, models and charts.
Practical 10	To study about surface anatomy of Female reproductive system by specimen, models and charts.

Text Book (s):

1. B.D. Chaurasia's Handbook of General Anatomy 4th edition, CBS Publishers & distributors, 2013, ISBN: 978-8123916545
2. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Upper limb & Thorax (volume-1) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1155-6
3. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Lower limb Abdomen and Pelvis (volume-2) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1156-4

Reference Book (s):

1. H.McMinn, John Pegington, Peter H. Abrahams. A Color Atlas of Human Anatomy 3rd edition, M, Mosby, 1996, ISBN: 978-0815158585
2. Richard S. Snell. Clinical Anatomy for Medical Students 6th edition, Lippincott Williams & Wilkins, 2000, ISBN: 9780781715744
3. Derek Field. Field's Anatomy, Palpation and Surface Marking 4th edition, Butterworth-Heinemann Ltd, 2006, ISBN: 978-0750688482

The student is expected to study:

1. The physiological functions of the systems of Human body with special emphasis on haematology and amphibian experiments.
2. The physiological principles in the practice of physical therapy.

Course Outcomes

CO1	Utilize their knowledge for identification of various pathological events that are leading to the disease process.
CO2	To gain an understanding of the basics of clinical examination for diagnosis of the disease process.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	00	70	100

Course Content:

List of Practical	15 Hours
<ol style="list-style-type: none"> 1. Study of Microscope and its uses 2. Determination of RBC count, WBC count, Differential leukocyte count 3. Estimation of hemoglobin 4. Determination of blood group, bleeding time, clotting time Demonstrations only 5. Calculation of blood indices 6. Determination of blood group, bleeding time, clotting time Demonstrations only 7. Determination of ESR, PCV 8. Simple muscle curve, Effect of increasing the strength of the stimuli, Effect of two successive stimuli. 9. Effect of temperature on muscle contraction, Effect of load on muscle contraction 10. Effect of Fatigue, Genesis of tetanus and clonus. 	

Suggested Reading

1. Dr. A. K. Jain. Textbook of Physiology (Set of 2 Volumes) 5th Edition, Avichal Publishing Company, ISBN: 9788177393583
2. Dr. A. K. Jain. Manual of Practical Physiology For Mbbs 4th edition, Avichal Publishing Company, ISBN: 9788178553153
3. A.C.Guyton, J.E. Hall. Textbook of Medical Physiology 11th edition, Elsevier Saunders, 2006, ISBN: 9780721602400

Name of The Course	Human Physiology -I(Lab)			
Course Code	BPHY1010			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

- R. L. Bijlani, S. Manjunatha. Understanding Medical Physiology: A textbook for Medical Students 4th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2011, ISBN: 978-80704-81-4
- Kim E.Barrett, Susan M Burman, Scott Boitano, Heddwen L. Brooks. Ganong's Review of Medical Physiology 24th edition, McGraw-Hill Medical Publishers, 2012, ISBN: 978-0071780032

- To study cell biology.
- To study structure of electrolytes

Suggested Reading

- Lab Manual provided by Subject Teacher
- Textbook of Medical Biochemistry –Chatterjee and Shinde**
- T.B of Biochemistry for medical students-Vasudevan**
- D.M-Jaypee Bros.10th edition**
- T.B of Biochemistry-Chatterjee M.N- Jaypee Bros 6th edition**

Name of The Course	BIOCHEMISTRY LAB			
Course Code	BPHY1011			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Name of The Course	Basic computer and information science (Lab)			
Course Code	BPHY1012			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

To study:

- The Clinical Biochemistry
- The various metabolic pathways
- The basic knowledge and requirements of vitamins, minerals and nutrition.

Course Outcomes

CO1	To understand the clinical biochemistry.
CO2	To understand the importance of nutrition

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

List of Practicals	15 hours
1. To Study Biochemistry of Connective Tissues.	
2. To Study Muscle Contraction phenomena.	
3. To Study Clinical Biochemistry.	
4. To Study Balanced Diet plan for diabetics and weight loss	
5. To study about vitamins	
6. To Study Factors affecting Enzyme Activity	
7. To Study Nucleotide & Nucleic acid Chemistry	
8. To study mechanism of hormone action.	

Course Objectives

- Computer technology.
- The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

Course Outcomes

CO1	To know basic of computers
CO2	To apply the concept of windows & MS-word, power point and excel.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content: 15 hours

Practical 1	Data entry efficiency
Practical 2	Learning to use MS office: MS word
Practical 3	Learning to use of MS PowerPoint
Practical 4	Learning to use of MS excel 5 hours

Practical 5	Learning to use different operating system & its application.
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Suggested Reading

1. Introduction to Computers by Dr Darrell W Hajek
2. (Lecture Notes in Computer Science 1491) W. Reisigs, G. Rozenberg (auth.), Wolfgang Reisig, Grzegorz Rozenberg (eds.) - Lectures on Petri Nets I_ Basic Models_ Advances in Petri Nets- Springer-VerlagB.djvu
3. Introduction to Computer Systems for Health Information Technology by Nanette B Sayles

Name of The Course	Introduction to Yoga- Basic theory, science and techniques (Lab)			
Course Code	BPHY1013			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. The principles of yoga techniques e.g. asana, meditation, relaxation, stretching, strengthening
2. To understand the basic science

Course Outcomes

CO1	Demonstrate the basic techniques of the beginner group of asanas and various groups of asanas according to the body position
CO2	Illustrate the Relaxation techniques of Yoga.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50			50

Course Content: 15 hours

Practical 1: Sukshma Vyayama/Sithilikarna Vyayama and Surya Namaskar s
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- Loosening exercises of each part of the body particularly of the joints
- b. 12 step Surya namaskar with prayer and specific mantras

Practical 2: Yogic kriyas [Observation/ demonstration only]

- a. Neti (Jala Neti, Sutra Neti)
- b. Dhauti (Vamana Dhauti, Vastra Dhauti)
- c. Trataka
- d. Shankaprakshalana (Laghu & Deergha)

Practical 3:

Yogasanas

- **a. Standing postures**
 - i. Tadasana (Upward stretch posture)
 - ii. Ardha Chakrasana (Half wheel posture)
 - iii. Ardha Katicakrasana (Half lumbar wheel posture)
 - iv. Utkatasana (Chair posture)
 - v. Pada Hastasana (Hand to toes posture)
 - vi. Trikonasana (Triangle posture)
 - vii. Parshva Konasana (Side angle posture)
 - viii. Garudasana (Eagle posture)
 - ix. Vrikshasana (Tree posture)

Practical 4: Pranayamas

b. Prone postures

- i. Makarasana (Crocodile posture)
- ii. Bhujangasana (Cobra posture)
- iii. Salabhasana (Locust posture)
- iv. Dhanurasana (Bow posture)
- v. Naukasana (Boat posture)
- vi. Marjalasana (Cat posture)

Practical 5: Pranayamas

- **Supine postures**
 - i. Ardha halasana/ Uttana Padasana
 - ii. Sarvangasana (All limb posture)
 - iii. Pawana muktasana (Wind releasing posture)
 - iv. Matsyasana (Fish posture)
 - v. Halasana (Plough posture)
 - vi. Chakrasana (Wheel posture)

- vii. Setu Bandhasana (Bridge posture)
- viii. Shavasana (Corpse posture)

Practical 6: Pranayamas

- **Sitting postures**
- i. Parvatasana (Mountain posture)
- ii. Bhadrasana (Gracious posture)
- iii. Vajrasana (Adamantine posture)
- iv. Paschimottanasana (Back stretching posture)
- v. Janushirasana (Head to knee posture)
- vi. Simhasana (Lion posture)
- vii. Gomukhasana (Cow head posture)
- Ushtrasana (Camel posture)

Practical 7: Pranayamas : practice of correct breathing and Yogic deep breathing

- Kapalabhati
- Bhastrika
- Sitali
- Sitkari

Practical 8: Meditative postures and Meditation techniques

- Siddhasana (Accomplished pose)
- Padmasana (Lotus posture)
- Samasana
- Swastikasana (Auspicious posture)

Practical 9: Pranayamas

- Sadanta
- Ujjayi
- Surya Bhedana
- Chandra Bhedana
- Anuloma-Viloma/Nadishodana
- Bhramari

Practical 10: Relaxation Techniques

- Shavasana
- Yoga Nidra

Suggested Reading

- Swami SatyanandaSaraswati, "Asana, Pranayama, MudraBandha", Yoga Publication Trust, Thomson Press(India) Limited, 2013, ISBN: 978-81-86336-14-4
- Swami Muktibodhananda, "Hatha Yoga Pradipika", Yoga Publication Trust, Yoga Publication Trust, Thomson Press(India) Limited, 2012, ISBN:978-81-85787-38-1
- Dr Swami Karmananda, "Yogic Management of Common Diseases", Yoga Publication Trust, Yoga Publication Trust, Thomson Press(India) Limited, 2013, ISBN: 978-81-85787-24-4
- Dr. K. Ramesh Babu, "Aasana Sutras", Home of Yoga Publication, Vizianagaram
- Swami Prabhavananda "Patanjali Yoga Sutras", Sri Ramakrishna Math, Chennai, ISBN: 81-7823-108-5

Name of The Course	HumanAnatomy-II			
Course Code	BPHY2001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

1. Understanding of gross anatomy of various body parts.
2. Application of knowledge of anatomy to learn evaluation and application of physical therapy.
3. Major emphasis of learning is towards Musculo-skeletal, upper & lower extremity, head, neck, pelvis and nervous system.

Course Outcomes

CO1	Illustrate and identify the musculoskeletal anatomy and upper extremity anatomy
CO2	Interpret the anatomy of lower extremity and application of knowledge in patient evaluation and management
CO3	Identify and apply knowledge of trunk and pelvis anatomy in patient evaluation and management
CO4	Illustrate anatomy of head & neck anatomy and apply knowledge in evaluation and management of patient
CO5	Interpret the anatomy of nervous system and application of knowledge in patient evaluation and management
CO6	Imagine Surface markings

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Musculoskeletal Anatomy & Upper extremity	
10 hours	
<ul style="list-style-type: none"> ❖ Anatomical positions of body, axes, planes, common anatomical terminologies (Groove, tuberosity, trochanters etc) ❖ Connective tissue classification. ❖ Bones- Composition & functions, classification and types according to morphology and development. ❖ Joints-definition-classification, structure of fibrous, cartilaginous joints, blood supply and nerve supply of joints. ❖ Muscles – origin, insertion, nerve supply and actions. ❖ f. Upper Extremity <ul style="list-style-type: none"> i. Osteology: Clavicles, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges. ii. Soft parts: Breast, pectoral region, axilla, front of arm, back of arm, cubital fossa, front of fore arm, back of fore arm, palm, dorsum of hand, muscles, nerves, blood vessels and lymphatic drainage of upper extremity. iii. Joints: Shoulder girdle, shoulder joint, elbow joints, radio ulnar joint, wrist joint and joints of the hand. iv. Arches of hand, skin of the palm and dorsum of hand. 	
Unit II: Lower Extremity	
12 hours	
<ul style="list-style-type: none"> ❖ Osteology: Hip bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges. ❖ Soft parts: Gluteal region, front and back of the thigh (Femoral triangle, femoral canal and inguinal canal), medial side of the thigh (Adductor canal), lateral side of the thigh, popliteal fossa, anterior and posterior compartment of leg, sole of the foot, lymphatic drainage of lower limb, venous drainage of the lower limb, arterial supply of the lower limb, arches of foot, skin of foot. ❖ Joints: Hip Joint, Knee joint, Ankle joint, joints of the foot. 	
Unit III: Trunk & Pelvis	
10 hours	
<ul style="list-style-type: none"> ❖ Osteology: Cervical, thoracic, lumbar, sacral and coccygeal vertebrae and ribs. ❖ Soft tissue: Pre and Para vertebral muscles, intercostals muscles, anterior abdominal wall muscles, Inter-vertebral disc. ❖ Pelvic girdle and muscles of the pelvic floor. ❖ of various system of medicine. 	
Unit IV: Head & Neck	
10 hours	
<ul style="list-style-type: none"> ❖ Osteology: Mandible and bones of the skull. 	

- ❖ Soft parts: Muscles of the face and neck and their nerve and blood supply-extra ocular muscles, triangles of the neck.
- ❖ Gross anatomy of eyeball, nose, ears and tongue.

Unit-V: Neuroanatomy **10 hours**

- ❖ Cranial nerves
- ❖ Peripheral nervous system
- ❖ Peripheral nerve
- ❖ Neuromuscular junction
- ❖ Sensory end organs
- ❖ Central Nervous System
- ❖ Spinal segments and areas
- ❖ Brain Stem
- ❖ Cerebellum
- ❖ Inferior colliculi
- ❖ Superior Colliculi
- ❖ Thalamus
- ❖ Hypothalamus
- ❖ Corpus striatum
- ❖ Cerebral hemisphere
- ❖ Lateral ventricles
- ❖ Blood supply to brain
- ❖ Basal Ganglia
- ❖ The pyramidal system
- ❖ Pons, medulla, extra pyramidal systems
- ❖ Anatomical integration

Unit VI: Surface Markings: **8 hours****Surface markings of**

- ❖ Upper limb
- ❖ Lower limb
- ❖ Head and neck

Suggested Reading

1. B.D. Chaurasia's Handbook of General Anatomy 4th edition, CBS Publishers & distributors, 2013, ISBN: 978-8123916545
2. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Upper limb & Thorax (volume-1) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1155-6
3. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Lower limb Abdomen and Pelvis (volume-2) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1156-4
4. H.McMinn, John Pegington, Peter H. Abrahams. A Color Atlas of Human Anatomy 3rd edition, M, Mosby, 1996, ISBN: 978-0815158585

- Richard S. Snell. Clinical Anatomy for Medical Students 6th edition, Lippincott Williams & Wilkins, 2000, ISBN: 9780781715744
- Derek Field. Field's Anatomy, Palpation and Surface Marking 4th edition, Butterworth-Heinemann Ltd, 2006, ISBN : 978-0750688482

Name of The Course	Human Physiology – II			
Course Code	BPHY2002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

- The physiological functions of the systems of Human body with special emphasis on renal system, reproductive system, nervous system, special senses and physiological effects of exercise
- The physiological principles in the practice of physical therapy.

Course Outcomes

CO1	Illustrate and identify the renal system physiology.
CO2	Interpret the physiology of reproductive system.
CO3	Illustrate the physiology of the nervous system and interpret its role in normal function.
CO4	Interpret the physiology of special senses.
CO5	Illustrate and identify the physiology of exercise.
CO6	To develop understanding of applied physiology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Renal System	10 hours
<ul style="list-style-type: none"> Introduction: Nephrons – cortical and juxtamedullary. Juxta-glomerular apparatus. Glomerular membrane. Renal blood flow and its regulation. Functions of kidneys. Mechanism of Urine Formation Tubular Reabsorption Tubular Secretion Mechanism of concentrating and diluting the Urine Acid-Base balance (very brief) 	

Unit II: Reproductive system	10 Hours
<ul style="list-style-type: none"> Introduction: Physiological anatomy reproductive organs Male Reproductive System Female Reproductive System Menstrual Cycle 	
Unit III: Nervous System	12 Hours
<ul style="list-style-type: none"> Introduction: Organization of CNS – central and peripheral nervous system. Functions of nervous system. Sensory Mechanism: Sensory receptors: function, classification and properties. Sensory pathway: The ascending/descending tracts Sensory cortex. Somatic sensations: crude touch, fine touch, tactile localization, tactile discrimination, stereognosis, vibration sense, kinesthetic sensations. Pain sensation: mechanism of pain. Gate control theory of pain Reflex Action: components, Bell-Magendie law, classification and Properties. Monosynaptic and polysynaptic reflexes, superficial reflexes, deep reflexes. Stretch reflex– structure of muscle spindle, pathway, higher control and functions. Inverse stretch reflex. Muscle tone – definition, and properties hypotonia, atonia and hypertonia. UMNL and LMNL Sleep: REM and NREM sleep. CSF: Formation, composition, circulation and functions. Lumbar puncture and its significance. Blood brain barrier. Hydrocephalus. ANS: Features and actions of parasympathetic and sympathetic nervous system. 	
Unit IV: Special Senses	10 Hours:
<ul style="list-style-type: none"> Vision: Introduction: Functional anatomy of eye ball. Functions of cornea, iris, pupil, aqueous humor – glaucoma, lens – cataract, vitreous humor, rods and cones. Photopic vision. Scotopic vision. Visual Pathway and the effects of lesions. Visual Reflexes: Accommodation, Pupillary and Light. Color vision – color blindness. Nyctalopia. Audition: Physiological anatomy of the ear. Functions of external ear, middle ear and inner ear. Structure of Cochlea and organ of corti. Auditory pathway. Types of Deafness. Tests for hearing. Audiometry. Taste: Taste buds. Primary tastes. Gustatory pathway. Smell: Olfactory membrane. Olfactory pathway. Vestibular Apparatus: Crista ampullaris and macula. Functions. Disorders 	

Unit V: Physiology of exercises	10
Hours	
<ul style="list-style-type: none"> Effects of acute and chronic exercise on <ol style="list-style-type: none"> O₂ transport Muscle strength/power/endurance B.M.R. /R.Q. Hormonal and metabolic effect Cardiovascular system Respiratory system Body fluids and electrolyte Effect of gravity / altitude /acceleration / pressure on physical parameters 	
Unit VI: Applied Physiology	8 hours
<ul style="list-style-type: none"> Artificial Kidney: Principle of hemodialysis. Micturition and type of incontinence (related articles) Skin and temperature regulation Pregnancy tests. Placenta preservation, function of placenta EEG: Waves and features 	

Suggested Reading

- Dr. A. K. Jain. Textbook of Physiology (Set of 2 Volumes) 5th Edition, Avichal Publishing Company, ISBN: 9788177393583
- A. K. Jain, Human Physiology & Biochemistry For Physical & Occupational Therapy, A, Avichal Publishing Company, 2006, ISBN: 9788178552743
- A.C.Guyton, J.E. Hall. Textbook of Medical Physiology 11th edition, Elsevier Saunders, 2006, ISBN: 9780721602400
- R. L. Bijlani, S. Manjunatha, Understanding Medical Physiology: A textbook for Medical Students 4th edition. Jaypee Brothers Medical Publishers (P) Ltd, 2011, ISBN: 978-80704-81-4

Name of The Course	General and clinical psychology			
Course Code	BPHY2003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

- Importance of Psychological Status of the Person in Health & Disease, Environmental & Emotional Influence on the Mind & Personality.
- Acquire Knowledge as to How to Deal with the Patient.
- Psycho-social Assessment of Patients in Various Developmental Stages.

Course Outcomes

On course completion the student will be able to

CO1	To demonstrate knowledge of Psychological Maturation during human development, growth & alterations during ageing process.
CO2	To utilize the knowledge to become Perceptive, Socially aware & self-reflective.
CO3	Apply the knowledge to develop Emotional Competencies and understand psychological status of the person in health & disease.
CO4	To utilize the knowledge of Ego-Defence mechanism & learn counselling techniques to help those in need.
CO5	Demonstrate importance of health in the society & rehabilitation methods of patients which is related to the society.
CO6	To discuss psychological disorders

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

UNIT-1. Introduction to Psychology & Growth and Development	8 hours
Schools: Structuralism, functionalism, behaviorism, Psychoanalysis. Methods: Introspection, observation, inventory and experimental method. Psychology and physiotherapy Life span: Different stages of development (Infancy, childhood, adolescence, adulthood, middle age, old age). Heredity and environment: role of heredity and environment in physical and	

Psychological development, “Nature v/s Nurture controversy”.
UNIT-II Sensation, attention and perception 7 hours
Sensation: Vision, Hearing, Olfactory, Gustatory and Cutaneous sensation, movement, equilibrium and visceral sense. Attention: Types of attention, Determinants of attention (subjective determinants and objective determinants). Perception: Gestalt principles of organization of perception (principle of figure ground and principles of grouping), factors influencing perception (past experience and context). Illusion and hallucination: different types.
UNIT-III. Learning , Thinking, Motivation & Emotion 7 hours
Learning:-Factors effecting learning. Theories of learning: trial and error learning, classical conditioning, Operant conditioning, insight learning, social learning theory. The effective ways to learn: Massed/Spaced, Whole/Part, Recitation/Reading, Serial/Free recall, Incidental/Intentional learning, Knowledge of results, association, organization, and mnemonic methods. Thinking :- Reasoning: deductive and inductive reasoning. Problem solving: rules in problem solving (algorithm and heuristic). Creative thinking: steps in creative thinking, traits of creative people Motivation :- Motivation cycle (need, drive, incentive, reward). Classification of motives. Abraham Maslow’s theory of need hierarchy Emotion :-Three levels of analysis of emotion (physiological level, subjective state, and overt behavior). Theories of emotion. Stress and management of stress.
UNIT-IV. Intelligence & Personality- Frustration & Conflicts 7 hours
Intelligence :-Theories of intelligence. Distribution of intelligence. Assessment of intelligence.

Personality :-Approaches to personality: type & trait, behavioristic, psychoanalytic and humanistic approach. Personality assessment: observation, situational test, questionnaire, rating scale, interview, and projective techniques. Defense Mechanisms: denial of reality, rationalization, projection, reaction formation, identification, repression, regression, intellectualization, undoing, introjection, acting out. Frustration & Conflicts :- Frustration: sources of frustration. Conflict: types of conflict. Management of frustration and conflict
UNIT-5. Social & Clinical psychology 8 hours
Social Psychology:- Leadership: Different types of leaders. Different theoretical approaches to leadership. Attitude: development of attitude. Change of attitude. Clinical psychology :- Models of training, abnormal behavior assessment, clinical judgement, Psychotherapy, self-management methods, physiotherapist patient interaction, aggression, self imaging, stress management, assertive training, Group therapy, Body awareness, Pediatric, child and geriatric clinical psychology.
Unit VI- Psychological disorders 8 hours
<ul style="list-style-type: none"> • Eating disorders • Phobias • Borderline personality disorder • Seasonal affective disorder

Suggested Reading

1. Patricia F. Waller. Introduction to Psychology 4th edition, Clifford T. Morgan, Richard A. King , Paul G. Shinkman, McGraw-Hill Book, 1971, ISBN: 978-0-07-043085-3
2. Introduction to social Psychology- Akolkar- Oxford Publishing House.
3. Psychology and Sociology- Applied to Medicine- Porter & Alder- W.B Saunders.
4. Psychology: Six Perspectives, L. Dodge Farnald, SAGE Publications, 2007, ISBN: 978-1412938679

5. J. H. Turner. The Structure of Sociological Theory 1st edition, Dorsey publisher, 1974, ASIN: B0039BDDEM
6. Robert A. Baron, Nyla R. Branscombe, Donn Byrne. Social Psychology 12th edition, Allyn & Bacon publishers, 2008, ISBN : 978-0205581498

Name of The Course	BASIC PRINCIPLES OF BIOMECHANICS			
Course Code	BPHY2004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To study the basic concepts of human movement, and application of various biomechanical principles in the evaluation and treatment of disorders of musculoskeletal system.
2. Students are taught to understand the various quantitative and qualitative methods of movement. Mechanical principles of various treatment methods are studied.
3. To study posture and gait.

Course Outcomes:

On course completion the student Shall be able to:

CO1	To identify the mechanical principles of muscular and skeletal system reacting to various forces.
CO2	To assess the joint structure and principles of physics in the analysis of joint function and dysfunction

Unit-2 Joint structure and Function 9 lecture hours
a. Joint design b. Materials used in human joints c. General properties of connective tissues d. Human joint design

CO3	To assess the muscle structure and connective tissue behaviour in the analysis of muscle function and dysfunction
CO4	To interpret the structure and movement examination of thorax and chest wall in healthy and unhealthy individuals.
CO5	To identify the anatomical, function and dysfunction of Temporomandibular joint
CO6	To Imagine various biomechanical principles in Sports & Corporate.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course contents:

Unit-1 Basic Concepts in Biomechanics.9 lecture hours
Kinematics and Kinetics
a. Types of Motion
b. Location of Motion
c. Direction of Motion
d. Magnitude of Motion
e. Definition of Forces
f. Force of Gravity
g. Reaction forces
h. Equilibrium
i. Objects in Motion
j. Force of friction
k. Concurrent force systems
l. Parallel force system
m. Work
n. Moment arm of force
o. Force components
p. Equilibrium of levers .

e. Joint function
f. Joint motion
g. General effects of disease, injury and immobilization
Unit-3 Muscle structure and function 9 lecture hours
a. Mobility and stability functions of muscles
b. Elements of muscle structure

c. Muscle function
d. Effects of immobilization, injury and aging
Unit-4 Biomechanics of the Thorax and Chest wall 9 lecture hours
a. General structure and function
b. Rib cage and the muscles associated with the rib cage
c. Ventilatory motions: its coordination and integration
d. Developmental aspects of structure and function
e. Changes in normal structure and function In relation to pregnancy, scoliosis and COPD
Unit-5 The Temporomandibular Joint- 9 lecture hours
a. General features, structure, function and dysfunction
Unit -6 Recent advances 8 Lecture hours
Ergonomics Biomechanics in Sports

Text Book (s)

- Principles of Exercise Therapy 4th edition, M. Dena Gardiner, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
- Joint Structure and Function: A Comprehensive Analysis 5th edition, Pamela K Levangie, Cynthia C Norkins, F. A. Davis Company, 2010, ISBN: 978-0803623620
- Therapeutic Exercise: Foundations and Techniques 6th edition, Carolyn Kisner, Lynn Allen Colby, F.A. Davis Company, 2012, ISBN: 978-0803625747

Reference Book (s)

- Practical Exercise Therapy, 4th edition, Margaret Hollis & Phyl Fletcher cooks, Wiley, 1999, ISBN: 9780632049738
- Clinical Kinesology and Anatomy (Clinical Kinesology for Physical Therapist Assistants), 5th edition ; Lynn Lippert, F.A. Davis Company, 2011, ISBN: 978-0-8036-2363-7
- Introduction to Physical Therapy 3rd edition, Michael A. Pagliarulo, Mosby, 2006, ISBN: 978-0323032841

Name of The Course	Medical Terminology and Record Keeping			
Course Code	BPHY2005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

- To study the various medical terminology
- To study the basic knowledge of record keeping

Course Outcomes

CO1	To utilize their knowledge in for maintaining various file according to the medical terminology
CO2	That will help in professional life to maintain the record of various patients according to the disease
CO3	Apply the knowledge of Terminology in different disease suffix, prefix, abbreviations

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50			50

Course Content:

Unit I: Introduction and Basic medical terminology 10 hours
<ol style="list-style-type: none"> Derivation of medical terms. Define word roots, prefixes, and suffixes. Conventions for combined morphemes and the formation of plurals Basic medical terms in health care and physiotherapy. Form medical terms utilizing roots, suffixes, prefixes, and combining roots. Interpret basic medical abbreviations/symbols.
Unit II: Procedure and diagnostic terms 10 hours
<ol style="list-style-type: none"> Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system,

musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.

- b) Interpret medical records/reports. Lab (Pathological, Biochemistry) Radiological report (X –Ray, MRI Scan, CT scan, Ultrasound report)

Unit III: Data management 10 hours

Data entry and management on electronic health record system. Excel, Word, PDF, ETC.

Suggested Reading

1. Medical terminology for health professional by Anna Ehrlich, Carol L, Schroeder, Laura Ehrlich, Katrina A. Schroeder. ISBN-13: 978-1418072520. ISBN-10: 1418072524
2. Medical terminology by David Anderson, Publisher: Medical Creations; 2 edition (November 14, 2016)
3. MEDICAL TERMINOLOGY FOR STUDENTS OF THE HEALTH PROFESSIONS 3/E By Bosman JP, Kritzing JPK, Meiring JH, Schumann CJ, Abrahams PH, Greyling LM ISBN: 9780627035951, publishing 2018.

Name of The Course	Human Anatomy Lab-II			
Course Code	BPHY2006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	6	3

Course Objectives

The student is expected to study:

1. Understanding of gross anatomy of various body parts.
2. Application of knowledge of anatomy to learn evaluation and application of physical therapy.
3. Major emphasis of learning is towards Musculo-skeletal, upper & lower extremity, head, neck, pelvis and nervous system.

Course Outcomes

CO1	Illustrate and identify the musculoskeletal anatomy and upper extremity anatomy
CO2	Interpret the anatomy of lower extremity and application of knowledge in patient evaluation and management
CO3	Identify and apply knowledge of trunk and pelvis anatomy in patient evaluation and management
CO4	Illustrate anatomy of head & neck anatomy and apply knowledge in evaluation and management of patient

CO5	Interpret the anatomy of nervous system and application of knowledge in patient evaluation and management
CO6	Interpret the surface markings.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical	90 hours
<ol style="list-style-type: none"> 1. To Study the bones of Shoulder Girdle & its muscle attachment. 2. To Study the bones of Forearm & its muscle attachment. 3. To Study the bones of wrist & its muscle attachment. 4. To Study the bones of pelvic Girdle & its muscle attachment. 5. To Study the bones of leg & its muscle attachment. 6. To Study the bones of Foot & its muscle attachment. 7. To Study the bones of skull & muscle of the face. 8. To Study the structures of central nervous system & peripheral nervous system. 9. To study the anatomy of cranial nerves. 10. To study the anatomy of spinal cord-ascending & descending tracts. 11. To study the surface markings of upper limb 12. To study the surface markings of lower limb 	

Suggested Reading

1. B.D. Chaurasia's Handbook of General Anatomy 4th edition, CBS Publishers & distributors, 2013, ISBN: 978-8123916545
2. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Upper limb & Thorax (volume-1) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1155-6
3. B.D. Chaurasia's Human Anatomy: Regional & Applied dissection and Clinical Lower limb Abdomen and Pelvis (volume-2) 4th edition, CBS Publishers & distributors, 2004, ISBN: 81-239-1156-4
4. H.McMinn, John Pegington, Peter H. Abrahams. A Color Atlas of Human Anatomy 3rd edition, M, Mosby, 1996, ISBN: 978-0815158585
5. Richard S. Snell. Clinical Anatomy for Medical Students 6th edition, Lippincott Williams & Wilkins, 2000, ISBN: 9780781715744

6. Derek Field. Field's Anatomy, Palpation and Surface Marking 4th edition, Butterworth-Heinemann Ltd, 2006, ISBN : 978-0750688482

Practical 7	Normal cardiogram of amphibian heart.
Practical 8	Properties of Cardiac muscle, ECG Demonstrations
Practical 9	Effect of temperature on cardiogram.
Practical 10	Spirometry Demonstrations

Suggested Reading

7. Dr. A. K. Jain. Textbook of Physiology (Set of 2 Volumes) 5th Edition, Avichal Publishing Company, ISBN: 9788177393583
8. A. K. Jain, Human Physiology & Biochemistry For Physical & Occupational Therapy, A, Avichal Publishing Company, 2006, ISBN: 9788178552743
9. A.C.Guyton, J.E. Hall. Textbook of Medical Physiology 11th edition, Elsevier Saunders, 2006, ISBN: 9780721602400
10. R. L. Bijlani, S. Manjunatha, Understanding Medical Physiology: A textbook for Medical Students 4th edition. Jaypee Brothers Medical Publishers (P) Ltd, 2011, ISBN: 978-80704-81-4

Name of The Course	Human Physiology-II (Lab)			
Course Code	BPTHY2007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	3	1.5

Course Objectives

- 1.The physiological functions of the systems of Human body with special emphasis on renal system, reproductive system, nervous system, special senses and physiological effects of exercise
- 2.The physiological principles in the practice of physical therapy.

Course Outcomes

CO1	Utilize their knowledge for identification of various pathological events that are leading to the disease process.
CO2	Apply the knowledge to identify various abnormalities in cardiovascular, respiratory and nervous system.
CO3	Demonstrate the examination of various physiological processes.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practical 1	Examination of Radial pulse and Recording of blood pressure
Practical 2	Examination of CVS
Practical 3	Examination of Respiratory system and Artificial Respiration Demonstrations
Practical 4	Examination of Sensory and motor system
Practical 5	Examination of reflexes
Practical 6	Examination of cranial nerves

Name of The Course	General and Clinical Psychology(Lab)			
Course Code	BPHY2008			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

1. Basic principles of assessment and application of physical therapy in treatment of various Psychological Disorders.

2. Importance of psychological status of the person in health & disease, environmental & emotional influence on the mind & personality

Course Outcomes

On course completion the student will be able to

CO1	To demonstrate knowledge and understanding of common psychological disorders and the techniques used for assessments and treatment
CO2	To utilize the knowledge of psycho-social assessment of patients in various developmental stages.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

15 hours

List of Practicals

1. Demonstration of basic principles of application of physical therapy in treatment of various Psychological Disorders.

2. Demonstration of basic principles of application of physical therapy in Psychotic Disorders.

3. Demonstration of basic psychological testing and their uses: Personality test

4. Demonstration of basic psychological testing and their uses: Problem solving ability

5. Demonstration of basic psychological testing and their uses: Tests of Intelligence

6. Demonstration of basic psychological testing and their uses: Learning

7. Demonstration of basic psychological testing and their uses: Memory

8. Demonstration of basic concepts, approaches, process & applications of Counselling: Relationship between counselling, psychotherapy Group-counselling, Counselling session

9. Demonstration Importance of Health in the society & rehabilitation methods of patient which is related to the society: Prevention—Primary, Secondary & Tertiary & Rehabilitation

10. To demonstrate Effective Communication & Rapport formation with the patients. And Ways of improving clinical compliance of patients

Suggested Reading

1. Patricia F. Waller. Introduction to Psychology 4th edition, Clifford T. Morgan, Richard A. King, Paul G. Shinkman, McGraw-Hill Book, 1971, ISBN: 978-0-07-043085-3
2. Introduction to social Psychology- Akolkar- Oxford Publishing House.
3. Psychology and Sociology- Applied to Medicine- Porter & Alder- W.B Saunders.

4. Psychology: Six Perspectives, L. Dodge Farnald, SAGE Publications, 2007, ISBN: 978-1412938679
5. J. H. Turner. The Structure of Sociological Theory 1st edition, Dorsey publisher, 1974, ASIN: B0039BDDEM
6. Robert A. Baron, Nyla R. Branscombe, Donn Byrne. Social Psychology 12th edition, Allyn & Bacon publishers, 2008, ISBN : 978-0205581498

Name of The Course	Basic principles of biomechanics (practical)			
Course Code	BPHY2009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. To understand the basic principles of biomechanics.
2. Describe the relation between the movement and force system on the anatomical structure of body.
3. To relate the changes of force because of the mobility and stability of normal and abnormal structures.

Course Outcomes

On course completion the student will be able to

CO1	To demonstrate the change of normal structure and function in relation to the change of forces.
CO2	To assess the joint structure and principles of physics in the analysis of joint function and dysfunction.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content: 15 hours

List of Practical

1. To demonstrate body levers.
2. To Study different force systems (GRF, moment arm) in various instruments (shoulder wheel, shoulder ladder, balancing board etc).
3. To study different types of pulley's & anatomical pulley's.
4. To study basic Human joint design. (concavo-convex rule).
5. To study different joints with relation to design, axis/planes of motion & ROM.
6. To study general structure, types of muscles & their functions.
7. To Study biomechanical properties of muscles. (extensibility, strength, endurance etc).
8. To study biomechanical properties of muscle in special cases (aged, diseased, disorder, contractures etc)
9. To Study Biomechanics of thoracic cage & breathing pattern. (bucket handle, pump handle)
10. To study biomechanics of abnormal breathing pattern. (pregnancy, scoliosis, COPD etc).

Suggested Reading

- Principles of Exercise Therapy 4th edition, M. Dena Gardiner, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
- Joint Structure and Function: A Comprehensive Analysis 5th edition, Pamela K Levangie, Cynthia Norkins, F. A. Davis Company, 2010, ISBN: 978-0803623620
- Therapeutic Exercise: Foundations and Techniques 6th edition, Carolyn Kisner, Lynn Allen Colby, F.A. Davis Company, 2012, ISBN: 978-0803625747
- Carol A. Oatis. Kinesiology: The Mechanics and Pathomechanics of Human Movement 2nd edition, Lippincott Williams & Wilkins, 2008, ISBN: 978-0781774222

Reference Book (s)

- Practical Exercise Therapy, 4th edition, Margaret Hollis & Phyl Fletcher cooks, Wiley, 1999, ISBN: 9780632049738
- Clinical Kinesiology and Anatomy (Clinical Kinesiology for Physical Therapist Assistants), 5th edition ; Lynn Lippert, F.A. Davis Company, 2011, ISBN: 978-0-8036-2363-7
- Introduction to Physical Therapy 3rd edition, Michael A. Pagliarulo, Mosby, 2006, ISBN: 978-0323032841

Name of The Course	CLINICAL observation			
Course Code	BPHY 2010			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	5	2.5

Course Objectives

1. To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the under-graduate program and across their career
2. To ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bed-side demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers
CO2	Understanding the bedside assessment of a patient or to the course of the disease
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation
CO5	Understanding basic knowledge of exercise therapy and its implementation

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Contents:

<p>Unit-1</p> <p>The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system - Sub centre, PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.</p>
<p>Unit-2</p> <p>The student will also be briefed regarding information about a patient's clinical status including signs, symptoms, and course of a disease</p>
<p>Unit-3</p> <p>Clinical visit to their respective professional department within the hospital.</p>
<p>Unit-4</p> <p>The students will learn about the construction and principle of working of various electrotherapeutic modalities and will be explained the indications, contraindications and harmful effects of the same. They will be taught to perform a check for all modalities. This will enable the students to apply these modalities for therapeutic purpose efficiently.</p>
<p>Unit-5</p> <p>Develop the skills of the students in areas like assessment of physical parameters (joint range of motion, muscle strength etc) and principles of exercise therapy (strengthening, stretching, goniometry etc) and its application.</p> <p>Hands on practice</p> <ul style="list-style-type: none"> • Mobilization Mulligan technique • Topic presentation • Case presentation

Suggested Reading

Text Book (s):

- Textbook of rehabilitation by S. Sanders

Tidy's Physiotherapy, 12th edition, Ann M. Thomson, Alison T. Skinner, Joan

Name of The Course	PATHOLOGY			
Course Code	BPHY3001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

- 1. The deviations in the structure and functions of tissues and body organs when diseased**
- 2. Describe the classification and characteristics of disease producing micro organisms**
- 3. Explain the various types of immunity**

Course Outcomes

CO1	To demonstrate an understanding of the inflammation in human body and the immune system and its related pathologies.
CO2	To demonstrate the structure of musculoskeletal system, Alimentary tract and Endocrine system in human body and the related pathologies
CO3	To show how cardio-respiratory, hepato-biliary and lymphatic system is employed in the human body the function it carries and the pathologies related to it
CO4	To utilize the basic principles of central nervous system in the human body, how it functions and the applied pathology it suffers from
CO5	To demonstrate the various types of cancers and its pathology
CO6	To illustrate type of corona virus and pathology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<p>Unit I: Cell injuries, Inflammation and Repair, Immunopathology and Infectious diseases</p> <p>Introduction to Pathology</p> <p>Cell injuries –</p> <ol style="list-style-type: none"> Aetiology and Pathogenesis with a brief recall of important aspects of normal cell structure. Reversible cell injury: Types, Sequential changes, Cellular swellings, vacuolation, Hyaline changes, Mucoid changes. Irreversible cell injury: Types of Necrosis & Gangrene, Autolysis. Pathologic calcification: Dystrophic and Metastatic. Intracellular Accumulations - Fatty changes, Protein accumulations, Glycogen accumulations, Pigments - Melanin / Hemosiderin. Extra cellular accumulations: Amyloidosis - Classification, Pathogenesis, Pathology including special stains. <p>Inflammation and Repair –</p> <ol style="list-style-type: none"> Acute inflammation: features, causes, vascular and cellular events. Inflammatory cells and Mediators. Chronic inflammation: Causes, Types, Classification nonspecific and granulomatous with examples. Repair, Wound healing by primary and secondary union, factors promoting and delaying the process. Healing in specific site including bone healing. <p>Immunopathology –</p> <ol style="list-style-type: none"> Immune system: General concepts. Hypersensitivity: type and examples, antibody and cell mediated tissue injury with examples. . Secondary immunodeficiency including HIV infection. Auto-immune disorders: Basic concepts and classification, SLE. AIDS-Aetiology, Modes of transmission, Diagnostic procedures, handling of infected material and health education. <p>Infectious diseases –</p> <ol style="list-style-type: none"> Mycobacterial diseases: Tuberculosis, Leprosy and

<p>Syphilis.</p> <p>b. Bacterial disease: Pyogenic, Diphtheria, Gram negative infection, Bacillary dysentery.</p> <p>c. Viral diseases: Poliomyelitis, Herpes, Rabies, Measles, Ricktsia, Chlamydial infection, HIV infection.</p> <p>d. Fungal disease and opportunistic infections.</p> <p>Parasitic diseases: Malaria, Filaria, Amoebiasis, Kala-azar, Cysticercosis, Hydatid cyst</p>
<p>Unit II: Unit-2: Circulatory Disturbances, Growth Disturbances and Neoplasia, Nutritional Disorders, and Genetic Disorders</p>
<p>Circulatory Disturbances –</p> <ol style="list-style-type: none"> 1. Hyperemia/Ischemia and Haemorrhage Edema: Pathogenesis and types. Chronic venous congestion: Lung, Liver, Spleen, Systemic Pathology Thrombosis and Embolism: Formation, Fate and Effects. 2. Infarction: Types, Common sites. 3. Shock: Pathogenesis, types, morphologic changes. <p>Growth Disturbances and Neoplasia</p> <ol style="list-style-type: none"> a. Atrophy, Hypertrophy, Hyperplasia, Aplasia, Hypoplasia, Metaplasia, Malformation, agenesis, dysplasia. b. Precancerous lesions. c. Neoplasia: Definition, classification, Biological behaviour : Benign and Malignant, Carcinoma and Sarcoma. d. Malignant Neoplasia: Grades and Stages, Local & Distant spread. e. Carcinogenesis: Environmental carcinogens, chemical, viral, occupational. Heredity and cellular oncogenes and prevention of cancer. f. Benign & Malignant epithelial tumours Eg. Squamous papilloma, Squamous cell carcinoma, Malignant melanoma. Benign & Malignant mesenchymal tumours Eg: Fibroma, Lipoma, Neurofibroma, Fibrosarcoma, Liposarcoma, Rhabdo-myosarcoma, Teratoma. <p>Nutritional Disorders –</p> <ol style="list-style-type: none"> a. Protein energy malnutrition: Marasmus, Kwashiorkor, and Vitamin deficiency disorders, classification with specific examples. <p>Genetic Disorders –</p>

<p>Basic concepts of genetic disorders and some common examples and congenital malformation</p>
<p>Unit III: Unit-3: Hepato-biliary, Cardiovascular, Respiratory system and Endocrine pathology</p>
<p>Hepato – biliary pathology.</p> <ol style="list-style-type: none"> a. Jaundice: Types, aetio-pathogenesis and diagnosis. Hepatitis: Acute, Chronic, neonatal. b. Alcoholic liver disease c. Cirrhosis: Postnecrotic, Alcoholic, Metabolic and Portal hypertension Liver abscesses; Pyogenic, parasitic and Amoebic. Tumours of Liver <p>Cardiovascular Pathology</p> <ol style="list-style-type: none"> a. Congenital Heart disease: Atrial septal defect, Ventricular septal defect, Fallot's tetralogy, Patent ductus arteriosus. b. Endocarditis. Rheumatic Heart disease. c. Vascular diseases: Atherosclerosis, monckeberg's medial calcification, Aneurysm and Arteritis and tumours of Blood vessels. d. Ischemic heart Disease: Myocardial infarction. Hypertension and hypertensive heart Disease. <p>Respiratory system:</p> <ol style="list-style-type: none"> a. Pneumonia, Bronchitis, Bronchiectasis, Asthma, Tuberculosis, Carcinoma of lungs, Occupational lung diseases. <p>Endocrine pathology:</p> <ol style="list-style-type: none"> a) Diabetes Mellitus: Types, Pathogenesis, Pathology, Laboratory diagnosis Non-neoplastic lesions of Thyroid: Iodine deficiency goiter, autoimmune Thyroiditis, Thyrotoxicosis, myxedema, Hashimoto's thyroiditis. <p>Tumours of Thyroid: Adenoma, Carcinoma: Papillary, Follicular, Medullary, Anaplastic. Adrenal diseases: cortical hyperplasia, atrophy, tuberculosis, tumours of cortex and medulla</p>
<p>Unit IV: Unit IV: Neuropathology, Hematology and Musculoskeletal System</p>
<p>Neuropathology</p> <ol style="list-style-type: none"> a. Inflammations and Infections: TB Meningitis, Pyogenic Meningitis, viral meningitis and Brain Abscess

- b. Tuberculosis, Cysticercosis
 c. CNS Tumors, Astrocytoma, Neuroblastoma, Meningioma, Medulloblastoma

Hematology –

- a. Constituents of blood and bone marrow, Regulation of hematopoiesis. Anemia: Classification, clinical features & lab diagnosis.
 b. Nutritional anemias: Iron deficiency anemia, Folic acid, Vit. B 12 deficiency anemia including pernicious anemia. Hemolytic Anaemias: Classification and Investigations. Hereditary hemolytic anaemias: Thalessemia, Sickle cell anemia, Spherocytosis and Enzyme deficiencies.
 c. Acquired hemolytic anaemias
 a. Alloimmune, Autoimmune
 b. Drug induced, Microangiopathic Pancytopenia - Aplastic anemia.
 d. Hemostatic disorders, Vascular and Platelet disorders & lab diagnosis. Coagulopathies –
 a. Inherited
 b. Acquired with lab diagnosis.
 e. Leukocytic disorders: Leukocytosis, Leukopenis, Leukemoid reaction.
 f. Leukemia: Classification, clinical manifestation, pathology and Diagnosis. Multiple myeloma and disproteinemias.
 g. Blood transfusion; Grouping and cross matching, untoward reactions, transmissible infections including HIV & hepatitis, Blood-components & plasma-pheresis.

Musculoskeletal System

- a) Osteomyelitis, acute, chronic, tuberculous, mycetoma
 b) Metabolic diseases: Rickets/Osteomalacia, osteoporosis, Hyperparathyroidism, Paget's disease.
 c) Tumours Classification: Benign, Malignant, Metastatic and synovial sarcoma. Arthritis: Suppurative, Rheumatoid. Osteoarthritis, Gout, Tuberculous

Unit V: Unit-5: Dermatopathology and Lymphatic System, and Alimentary tract pathology

Dermatopathology

- a. Skin tumors: Squamos cell carcinoma, Basal cell carcinoma, Melanoma

Lymphatic System

Diseases of the gall bladder: Cholecystitis, Cholelithiasis, Carcinoma. Lymphadenitis - Nonspecific and granulomatous. Causes of Lymph Node enlargements. Reactive Hyperplasia, Primary Tumours - Hodgkin's and Non hodgkin's Lymphomas, Metastatic Tumours. Causes of Splenic Enlargements.

Alimentary tract:

Oral Pathology: Ulcers, leukoplakia, Carcinoma, oral cavity diseases and tumour of salivary gland & esophagus and

precancerous lesions, Esophagus inflammatory, functional disorders and tumours.

Stomach: Gastritis, Ulcer & Tumours.

Tumours and tumour like condition of the small and large Intestine: Polyps, carcinoid, carcinoma, Lymphoma

Unit VI: Pathology of corona

a. Etiologic and pathogenesis of COVID-19

b. Path-physiology of COVID-19

Suggested Reading:

1. HarshMohan.TextbookofPathology 5th edition, Anshan Publishers, 2005, ISBN : 978-1904798194
2. R. Ananthanarayan, C.K. Panikar. Text Book of Microbiology, Orient Blackswan, 2005, ISBN: 9788125028086
3. Vinay Kumar, Abul K. Abbas, Jon C. Aster. Robbin's Basic Pathology 9th edition, Saunders, 2012, ISBN: 978-1437717815
4. Prescott's Microbiology 8th edition, Joanne M.Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw-Hill, 2010, ISBN: 978-0077402563

Name of The Course	BPHY3002			
Course Code	Microbiology			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. To demonstrate an understanding of the general microbiology.
2. To demonstrate an understanding of the immune system and its role & pathogenesis.
3. To demonstrate the understanding of bacteriology in the human body and its pathogenesis.

Course Outcomes

CO1	To demonstrate an understanding of the general microbiology.
CO2	To demonstrate an understanding of the immune system and its role & pathogenesis.
CO3	To demonstrate the understanding of bacteriology in the human body and its pathogenesis.
CO4	To utilize the basic principles of mycology and virology.
CO5	To understand the clinical microbiology.
CO6	To create latest trends in microbiology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction Hours	8
<ul style="list-style-type: none"> • Definitions: infections, parasite, host, vector, fomite, contagious disease, infectious disease, epidemic, endemic, pandemic, Zoonosis, Epizootic, Attack rate. • Normal flora of the human body. • Routes of infection and spread; endogenous and exogenous infections; source at reservoir of infections. • Bacterial cell. Morphology limited to recognizing bacteria in clinical samples Shape, motility and arrangement. Structures, which are virulence, associated. • Physiology: Essentials of bacterial growth requirements. • Sterilization, disinfection and universal precautions in relation to patient care and disease prevention. Definition of asepsis, sterilization, disinfection. • Antimicrobials: Mode of action, interpretation of susceptibility tests, resistance spectrum of activity. 	
Unit II: Immunology Hours	9
<p>a) Basic principles of immunity immunobiology</p> <ul style="list-style-type: none"> • Lymphoid organs and tissues. • Antigen, Antibodies, antigen and antibody reactions. <p>b) Immunity</p> <ul style="list-style-type: none"> • Humoral immunity and its role in immunity. • Cell mediated immunity and its role in immunity. • Immunology of hypersensitivity. • Measuring immune functions. 	
Unit III: Bacteriology Hours	10
<p>a) Introduction</p> <ul style="list-style-type: none"> • Morphology, classification according to pathogenicity, mode of transmission, methods of prevention, collection and transport of samples for laboratory diagnosis, interpretation of laboratory reports. <p>b) Staphylococci, Streptococci and Pneumococci.</p> <p>c) Mycobacteria</p> <ul style="list-style-type: none"> • Tuberculosis, M.leprae, atypical mycobacteria, Enterobacteriaceae, <p>d) Vibrios</p>	

<ul style="list-style-type: none"> • V. cholerae and other medically important vibrios, Campylobacters and Helicobacters, Pseudomonas. <p>e) Bacillus anthracis, Sporing and non-sporing anaerobes</p> <ul style="list-style-type: none"> • Clostridia, Bacteroides and Fusobacteria. 	
Unit IV: Virology & Mycology	10
Hours	
<p>a) General Virology</p> <ul style="list-style-type: none"> • General properties: Basic structure and broad classification of viruses. • Pathogenesis and pathology of viral infections. • Immunity and prophylaxis of viral diseases. • Principles of laboratory diagnosis of viral diseases. • List of commonly used antiviral agents. <p>b) Mycology</p> <ul style="list-style-type: none"> • General properties of fungi. • Classification based on disease: superficial, subcutaneous, deep mycoses opportunistic infections including Mycotoxins, systemic mycoses. • General principles of fungal diagnosis, Rapid diagnosis. • Method of collection of samples. • Antifungal agents. 	
Unit V: Applied Microbiology	8
Hours	
<ul style="list-style-type: none"> • Streptococcal infections: Rheumatic fever and Rheumatic heart disease, Meningitis. • Tuberculosis • Pyrexia of unknown origin, leprosy • Sexually transmitted diseases, Poliomyelitis • Hepatitis • Acute-respiratory infections, Central nervous System infections, Urinary tract infections. • Pelvic inflammatory disease, Wound infection, Opportunistic infections, HIV infection. • Malaria, Filariasis, Zoonotic diseases. 	
Unit VI: Medical microbiology	
<ul style="list-style-type: none"> • Microbial Cosmetics • Microbial detection in Cosmetics • Microbial products • Nanotechnology methods for microbial detection 	

Suggested Reading

1. R. Ananthanarayan, C.K. Panikar. Text Book of Microbiology, Orient Blackswan, 2005, ISBN: 9788125028086
2. Prescott's Microbiology 8th edition, Joanne M.Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw-Hill, 2010, ISBN: 978-0077402563
3. Dr. D. R. Arora. Textbook of Microbiology 2nd edition, CBS Publishers, 2003, ISBN: 9788123909233

CO6	To adapt current trends in pharmacology
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Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: General Pharmacology	8 Hours
<ul style="list-style-type: none"> ❖ Introduction, Definitions, Classification of drugs, Sources of drugs, Routes of drug administration, Distribution of drugs, Metabolism and Excretion of drugs, Pharmacokinetics, Pharmacodynamics, Factors modifying drug response, Adverse effects. ❖ Autonomic Nervous system – General considerations – The Sympathetic and Parasympathetic Systems, Receptors, Somatic Nervous System ❖ Cholinergic and Anti-Cholinergic drugs, Adrenergic and Adrenergic blocking drugs, Peripheral muscle relaxants. 	
Unit II: Cardiovascular Pharmacology	8 hours
<ul style="list-style-type: none"> ❖ Drugs used in the treatment of heart failure: Digitalis, Diuretics, Vasodilators, ACE inhibitors Antihypertensive Drugs: Diuretics, Beta Blockers, Calcium Channel Blockers, ACE Inhibitors, Central Acting Alpha Agonists, Peripheral Alpha Antagonists, Direct acting Vasodilators ❖ Antiarrhythmic Drugs ❖ Drugs used in the treatment of vascular disease and tissue ischemia: Vascular Disease, Hemostasis Lipid-Lowering agents, Antithrombotic, Anticoagulants and Thrombolytics Ischemic Heart Disease – Nitrates, Beta-Blockers, Calcium Channel Blockers, Cerebral Ischemia Peripheral Vascular Disease. 	
Unit III: Neuropharmacology, Disorder of movement, inflammatory and immune diseases	8 hours
Neuropharmacology <ul style="list-style-type: none"> ❖ Sedative-Hypnotic Drugs: Barbiturates, Benzodiazepines ❖ Antianxiety Drugs: Benzodiazepines, Other Anxiolytics ❖ Drugs Used in Treatment of Mood Disorders: Monoamine Oxidase Inhibitors, Tricyclic Antidepressants, Atypical Antidepressants, Lithium ❖ Antipsychotic drugs Disorders of Movement – <ul style="list-style-type: none"> ❖ Drugs used in Treatment of Parkinson’s disease ❖ Antiepileptic Drugs ❖ Spasticity and Skeletal Muscle Relaxants Inflammatory/Immune Diseases - <ul style="list-style-type: none"> ❖ Non-narcotic Analgesics and Nonsteroidal Anti-Inflammatory Drugs: Acetaminophen, NSAIDs, Aspirin, Nonaspirin NSAIDs, drug Interacts with NSAIDs 	

Name of The Course	Pharmacology			
Course Code	BPHY3003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

The student is expected to study:

- To study understand pharmaco-kinetics, pharmaco-dynamics.
- To be Oriented in the usage of common drugs with (indications, contraindications, side effects)
- Identify the drug actions that may affect the physical therapy treatment.

Course Outcomes

CO1	To demonstrate & understand the mechanism of actions of various drugs in general
CO2	To identify the effect of drugs that may alter or enhance the physical therapy treatment and thus modify the treatment accordingly.
CO3	Apply the knowledge of drug with the various systems of human body and with physical therapy treatment, eg pain management, Arthritis, post-surgery.
CO4	To utilize the knowledge of pharmacodynamics anatomy and physiology to understand the drug action on the human body in the management of pain, infection, hypertension ,thyroids etc.
CO5	Demonstrate application of various drug & physiotherapy in general rehabilitation process in various medical condition

❖ Glucocorticoids: Pharmacological Uses of Glucocorticoids, adverse effects, Physiologic Use of Glucocorticoids	
❖ Drugs Used in Treatment of Arthritic Diseases: Rheumatoid Arthritis, Osteoarthritis, Gout	
❖ Drugs Used in the Treatment of Neuromuscular Immune/Inflammatory Diseases: Myasthenia gravis, Idiopathic Inflammatory Myopathies, systemic lupus Erythematosus, Scleroderma, Demyelinating Disease	
❖ Respiratory Pharmacology: Obstructive Airway Diseases, Drugs used in Treatment of Obstructive Airway Diseases, Allergic Rhinitis	
Unit IV: Digestion and Metabolism	5 hours
❖ Gastrointestinal Pharmacology: Peptic Ulcer Disease, Constipation, Diarrhea Drugs Used in Treatment of Diabetes Mellitus: Insulin, Oral Hypoglycaemic.	
Unit-V: Geriatrics	6 hours
❖ Pharmacology and the geriatric Population: Adverse effects of special concern in the Elderly, Dementia, Postural hypotension.	
Unit VI: Latest trends	8 hours
<ul style="list-style-type: none"> Recent toxicological studies Pharmacoepidemiology and drug safety Clinical Pharmacology Pharmacogenetics and pharmacogenomics 	

Suggested Reading

1. K.D. Tripathi. Essentials of Medical Pharmacology 6th edition, Jaypee Brothers Medical Publishers, 2008, ISBN: 9788184480856
2. Gaddum's Pharmacology 8th edition, John H. Gaddum, Oxford University Press, 2008, ISBN: 9780192613073
3. Nirmala N. Rege, R.S. Satoskar, S.D. Bhandarkar. Pharmacology & Pharmacotherapeutics Revised 19th Edition, Popular Prakashan (P) Ltd., 2006, ISBN: 9788179912515
4. Laurence Brunton, Bruce Chabner, Bjorn C. Knollmann. Goodman and Gilman's The Pharmacological Basis of Therapeutics, 12th edition, McGraw-Hill Professional, 2010, ISBN: 978-0071

Name of The Course	Biomechanics and Kinesiology
Course Code	BPHY 3004

Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	5	0	0	5

Course Objectives

Students must study and learn to correlate:-

1. Muscle, Joint structure and function
2. Joint complexes of upper-lower limb and spine.
3. Kinematics

Course Outcomes

CO1	To demonstrate & Biomechanics of the Vertebral column muscles & joint clinically.
CO2	To Analyze the biomechanics of the shoulder, elbow & wrist complex in a clinical setting.
CO3	To Analyze the biomechanics of the hip, knee & ankle joint complex in a clinical setting.
CO4	To analyze the posture & gait of the vertebral column complex clinically
CO5	To kinematics and kinetics of the trunk and upper extremities in relation to gait
CO6	To gain the knowledge of kinematics and kinesiology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Biomechanics of the vertebral column	12 Hours
<ul style="list-style-type: none"> General structure and functions Regional structure and function – Cervical region, thoracic region, lumbar region, sacral region Muscles of the vertebral column General effects of injury and aging. 	
Unit II: Upper Limb	12 Hours
<ul style="list-style-type: none"> Shoulder complex structure and components of the shoulder complex and their integrated function Elbow complex - Structure and function of the elbow joint – humero-ulnar and radioulnar joint articulation, superior and inferior of radioulnar joint, 	

<p>mobility and stability of the elbow complex; the effects of immobilization and injury.</p> <ul style="list-style-type: none"> • Wrist joint- The wrist and hand complex: Structural components and functions of the wrist complex; structure of the hand complex; functional position of the wrist and hand. • Muscles and ligaments of upper joint. 	
Unit III: Biomechanics of the hip, Knee, Ankle joint its stability	12 Hours
<ul style="list-style-type: none"> • The hip complex: structure and function of the hip joint; hip joint pathology- arthrosis, fracture, bony abnormalities of the femur • The knee complex: structure and function of the knee joint – tibiofemoral joint and patellofemoral joint; effects of injury and disease. • The ankle and foot complex.: structure and function of the ankle joint, subtalar joint, talocalcaneo navicular joint, transverse tarsal joint, tarso metatarsal joints, metatarsophalangeal joints, interphalangeal joints, structure and function of the plantar arches, muscles of the ankle and foot, deviations from normal structure and function – Pes Planus and Pes Cavus 	
Unit IV: Analysis of posture and gait	12 Hours
<ul style="list-style-type: none"> • Analysis of Posture and Gait – Static and dynamic posture, postural control, kinetics and kinematics of posture, • Ideal posture analysis of posture, effects of posture on age, pregnancy, occupation and recreation; occupation and recreation. • general features of gait, gait initiation, kinematics and kinetics of gait, energy requirements 	
Unit V: Kinematics & Kinetics	12 Hours
<ul style="list-style-type: none"> • Kinematics and kinetics of the trunk and upper extremities in relation to gait. • Stair case climbing and running, effects of age, gender, assistive devices, disease, muscle weakness, paralysis, asymmetries of the lower extremities. • Injuries and mal alignments in gait. • Movement Analysis : ADL activities like sitting – to standing, lifting, various grips, pinches 	
Unit VI: Muscle Action in Sport and Exercise - Biomechanical view	8 Hours
<ul style="list-style-type: none"> • Neural Contributions to Changes in Muscle Strength - Mechanical Properties and Performance in Skeletal 	

Muscles - Muscle-Tendon Architecture and Athletic Performance.

- Eccentric Muscle Action in Sport and Exercise - Stretch–Shortening Cycle of Muscle Function - Biomechanical Foundations of Strength and Power Training

Suggested Reading

1. Pamela K. Levangie, Cynthia C. Norkin. Joint structure & function: A Comprehensive Analysis 5th edition, F. A. Davis Company, 2010, ISBN: 978-0803623620

2. Laura Smith, Elizabeth Weiss, Don Lehmkohl. Brunnstrom's Clinical Kinesiology 5th edition, F.A. Davis Company, 1996, ISBN: 978-0803679160

3. Carol A. Oatis. Kinesiology: The Mechanics and Pathomechanics of Human Movement 2nd edition, Lippincott Williams & Wilkins, 2008, ISBN: 978-0781774222

4. Freddy M Kaltenborn, Eileen Vollowitz. Manual Mobilization of the Joints - The Extremities 7th edition, , Orthopedic Physical Therapy Products, 2011, ISBN: 978-8270540709

Name of The Course	Foundation of Exercise Therapy and therapeutic massage			
Course Code	BPHY3005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

The student is expected to study:

1. Various methods of assessment of the physical parameters like joint ROM, muscle strength etc
2. The principles of exercise therapy e.g. relaxation, stretching, resisted exercises, massage.

Course Outcomes

CO1	Assess the Principle of Exercise therapy
CO2	Asses a patient applying the techniques of measuring range of motion for a joint, tests for neuromuscular efficiency, techniques of MMT
CO3	To interpret the principles of relaxation training used for rehabilitation
CO4	To illustrate the principles of types of resisted exercises for assessment
CO5	To illustrate the principles of massage therapy
CO6	To design latest trends in the field of exercise

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-I : Introduction to Exercise Therapy	12 hours
<ol style="list-style-type: none"> 1. Aim of exercise therapy 2. Techniques of exercise therapy 3. Approach to patients problem 4. Assessment of patients condition- measurement of vital parameters, 5. Starting position - fundamental and derived position, planning of treatment. 	
Unit-II Methods of Testing	12 hours
<ol style="list-style-type: none"> a).Functional tests b). Measurement of Joint range: ROM-Definition, Normal ROM for all peripheral joints & spine, Goniometer-parts, types, principles, uses, Limitations of goniometry, Techniques for measurement of ROM for all peripheral joints c). Tests for neuromuscular efficiency <ol style="list-style-type: none"> i. Electrical tests ii. Manual Muscle Testing: Introduction to MMT, Principles & Aims, Indications & Limitations, Techniques of MMT for group & individual: Techniques of MMT 	

for upper limb / Techniques of MMT for lower limb / Techniques of MMT for spine.

- iii. Anthropometric Measurements: Muscle girth – biceps, triceps, forearm, quadriceps, calf
- iv. Static power Test
- v. Dynamic power Test
- vi. Endurance test
- vii. Speed test

d.)Tests for Co-ordination
 e.) Tests for sensation
 f.) Pulmonary Function tests
 g.) Measurement of Limb Length: true limb length, apparent limb length, segmental limb length
 h). Measurement of the angle of Pelvic Inclination

Unit III: Relaxation **8 hours**

- 1) Definitions: Muscle Tone, Postural tone, Voluntary Movement,
- 2) Degrees of relaxation,
- 3) Pathological tension in muscle,
- 4) Stress mechanics, types of stresses, Effects of stress on the body mechanism,
- 5) Indications of relaxation, Methods & techniques of relaxation
- 6) Principles & uses: General, Local, Jacobson's, Mitchel's, additional methods.

Unit IV: Active, Passive, Free exercise, Active-Assisted Exercise and Types of Resisted Exercise **15 hours**

- Passive Movements
 - a. Causes of immobility, Classification of Passive movements, Specific definitions related to passive movements, Principles of giving passive movements, Indications, contraindications, effects of uses , Techniques of giving passive movements.
- Active Movements
 - a. Definition of strength, power & work, endurance, muscle actions.
 - b. Physiology of muscle performance: structure of skeletal muscle, chemical & mechanical

events during contraction & relaxation, muscle fiber type, motor unit, force gradation.

c. Causes of decreased muscle performance

d. Physiologic adaptation to training: Strength & Power, Endurance.

e. Types of active movements

- Free exercise:
Classification, principles, techniques, indications, contraindications, effects and uses
- Active Assisted Exercise:
principles, techniques, indications, contraindications, effects and uses

Assisted-Resisted Exercise: principles, techniques, indications, contraindications, effects and uses

- Resisted Exercise: Definition, principles, indications, contraindications, precautions & techniques, effects and uses

Types of resisted exercises: Manual and Mechanical resistance exercise, Isometric exercise, Dynamic exercise: Concentric and Eccentric, Dynamic exercise: Constant versus variable resistance, Isokinetic exercise, Open-Chain and Closed-Chain exercise.

Unit V: Therapeutic Massage 12 hours

1. History and Classification of Massage Technique
2. Principles, Indications and Contraindications
3. Technique of Massage Manipulations
4. Physiological and Therapeutic Uses of Specific Manipulations

Unit VI: Mindfulness plus marathons 8 hours

Concept of Mindfulness plus marathons

- Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
- Pamela K Levangie, Cynthia C Norkins. Joint Structure and Function: A Comprehensive Analysis 5th edition, F. A. Davis Company, 2010, ISBN: 978-0803623620

Name of The Course	Introduction to quality and patient safety			
Course Code	BPHY3006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

The student is expected to study:

1. To study the fundamentals of patient safety, evaluation of quality and quality measures and principles of quality improvement.
2. To understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance programs in the health system.
3. To study about the basic life support and emergency care

Course Outcomes

CO1	To develop the basic concepts of quality care and basic emergency care.
CO2	To illustrate the prevention of harm to workers, property, the environment and the general public.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit I: Quality care and Emergency care, Infection prevention and control

- ❖ **Quality assurance and management**
 - Concepts of Quality of Care
 - Quality Improvement Approaches
 - Standards and Norms
 - Quality Improvement Tools

Suggested Reading

- M. Dena Gardiner. Principles of Exercise Therapy 4th edition, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
- Margaret Hollis & Phyl Fletcher Cooks. Practical Exercise Therapy 4th edition, Wiley Publishers, 1999, ISBN: 9780632049738

- Introduction to NABH guidelines
- ❖ **Basics of emergency care and life support skills**
 - Vital signs and primary assessment
 - Basic emergency care – first aid and triage
 - Ventilations including use of bag-valve-masks (BVMs)
 - Choking, rescue breathing methods
 - One- and Two-rescuer CPR
 - Using an AED (Automated external defibrillator).
 - Managing an emergency including moving a patient

Unit II: Bio medical waste management and Disaster preparedness and management

- Definition of Biomedical Waste
- Waste minimization
- BMW – Segregation, collection, transportation, treatment and disposal (including color coding)
- Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
- BMW Management & methods of disinfection
- Modern technology for handling BMW
- Use of Personal protective equipment (PPE)
- Monitoring & controlling of cross infection (Protective devices)
- Fundamentals of emergency management,
- Psychological impact management,
- Resource management,
- Preparedness and risk reduction,
- Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.

Suggested Reading

1. CM Francis, Mario C De Souza. Hospital Administration, 3/e, 2004, JappeBrothers, ISBN9788171797219
2. Aspi F Golwalla, Sharukh A Golwalla. A Handbook of Emergencies, 8/e, 2015, JappeBrothers, ISBN9789351524724
3. Singh Anantpreet, Kaur Sukhjit, Biomedical Waste Disposal. 1/e, 2008, JappeBrothers, ISBN978935025554

Name of The Course	PATHOLOGY (LAB)
Course Code	BPHY3007
Prerequisite	
Co-requisite	

Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

1. Describe the classification and characteristics of disease producing micro organisms

Course Outcomes

CO1	To interpret the different type of cytological and specimen slides.
CO2	To demonstration of slides of common histopathological, and specimens and charts and their interpretations

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1. Demonstration of slides of common histopathological and specimens
2. Demonstration of slides of common haematological and and specimens
3. Determination of Erythrocyte Sedimentation Rate (ESR)
4. Charting and interpretation of cytological slides and specimens
5. Blood Collection
6. Use of antiseptics, disinfectants and insecticides in a tissue culture processing laboratory
7. Reception and labeling of histological specimens
8. To learn mounting of stained smears
9. Demonstration of instruments used for dissection
10. Pulmonary function test

Suggested Reading

1. Harsh Mohan. Textbook of Pathology 5th edition, Anshan Publishers, 2005, ISBN : 978-1904798194
2. R. Ananthanarayan, C.K. Panikar. Text Book of Microbiology, Orient Blackswan, 2005, ISBN: 9788125028086
3. Vinay Kumar, Abul K. Abbas, Jon C. Aster. Robbins' Basic Pathology 9th edition, Saunders, 2012, ISBN: 978-1437717815
4. Prescott's Microbiology 8th edition, Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw-Hill, 2010, ISBN: 978-0077402563

Name of The Course	Microbiology (Lab)
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Course Code	BPHY3008			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

The student is expected to study:

1. To study the important facts, concepts, and the investigative procedures of a microbiology laboratory.
2. To study the proper use and maintenance of the research grade laboratory equipments.
3. To study the fundamental laboratory methodology.

Course Outcomes

CO1	To demonstrate the various equipment and sterilization equipment used in microbiology.
CO2	To demonstrate the culture process and motility.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical	9 Hours each
1.Demonstration of Microscopes and its uses	
2.Principles of common sterilization equipment	
3.Uses of common sterilization equipment	
4.Demonstration of common sterilization equipment	
5.Demonstration of common culture media	
6.Demonstration of motility by hanging drops method	
7.Demonstration of Gram Stain	
8.Demonstration of ZN Stain	
9.Demonstration of Serological test: ELISA	

10.Demonstration of Fungus

Suggested Reading

1. R. Ananthanarayan, C.K. Panikar. Text Book of Microbiology, Orient Blackswan, 2005, ISBN: 9788125028086
2. Talaro, K., Chess, B., Foundations in Microbiology, 8th Ed.
3. Lammert, John M., Techniques in Microbiology A Student Handbook.
4. Prescott's Microbiology 8th edition, Joanne M.Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw-Hill, 2010, ISBN: 978-0077402563
5. Dr.D. R. Arora. TextbookofMicrobiology 2nd edition, CBS Publishers, 2003, ISBN: 9788123909233

Name of The Course	Biomechanics (Lab)			
Course Code	BPHY3009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course objective:

The student is expected to study:

1. Interpret the alignment of the body in erect standing posture and its variability
2. Illustrate the current understanding of the muscle needed to control erect standing
3. Interpret common postural faults

On course completion the student will be able to:

CO1	To Differentiate normal and abnormal posture.
CO2	To Interpret normal and abnormal gait analysis

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Course Contents:

List of Practical	9 Hours each
	1. Identify normal and abnormal posture.
	2. Gait Deviations – types, causative factors
	3. General features of gait, gait initiation
	4. Kinematics and kinetics of gait
	5. Kinematics and kinetics of the trunk and upper extremities in relation to gait Stair and running
	6. Effects of age, gender, assistive devices, disease, muscle weakness, paralysis, asymmetries of the lower extremities, injuries and malalignments in gait
	7. Normal gait with it parameters and identify abnormal gait with the problems in it.
	8. Movement analysis
	9. Biomechanics of hip joint
	10. Different Joints as a lever

Text Books:

- Pamela K. Levangie, Cynthia C. Norkin. Joint structure & function: A Comprehensive Analysis 5th edition, F. A. Davis Company, 2010, ISBN: 978-0803623620

Reference Books:

- Florence Peterson Kendall, Elizabeth Kendall McCreary, Patricia GeiseProvance, Mary McIntyre Rodgers, William Anthony Romani. Muscles: Testing and Function, with Posture and Pain 5th edition, Lippincott Williams & Wilkins, 2005, ISBN: 978-0781747806

- Laura Smith, Elizabeth Weiss, Don Lehmkuhl. Brunnstrom's Clinical Kinesiology 5th edition, F.A. Davis Company, 1996, ISBN: 978-0803679160
- Carol A. Oatis. Kinesiology: The Mechanics and Pathomechanics of Human Movement 2nd edition, Lippincott Williams & Wilkins, 2008, ISBN: 978-0781774222
- Freddy M Kaltenborn, Eileen Vollowitz. Manual Mobilization of the Joints - The Extremities 7th edition, Orthopedic Physical Therapy Products, 2011, ISBN: 978-8270540709

Name of The Course	Foundation of Exercise Therapy and therapeutic massage (LAB)			
Course Code	BPHY3010			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives**The student is expected to study:**

1. Various methods of assessment of the physical parameters like joint ROM, muscle strength etc
2. The principles of exercise therapy e.g. relaxation, stretching, resisted exercises, massage.

Course Outcomes

CO1	Assess the Principle of Exercise and massage therapy
CO2	Asses a patient applying the techniques of measuring range of motion for a joint, tests for neuromuscular efficiency, techniques of MMT
CO3	To interpret the principles of relaxation training and resisted exercises

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical:

1. Different test methods
2. Demonstrate relaxation techniques.
3. Demonstrate to apply the technique of passive movements
4. Demonstrate various techniques of Active movements
5. Demonstrate massage technique application according to body parts.
6. Demonstrate various resisted exercises.
7. Demonstrate use of active assisted movements.
8. Demonstrate normal ROM of joints of upper limb
9. Demonstrate normal ROM of joints of lower limb
10. Demonstrate MMT techniques

1. To understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
2. To provide knowledge on the principles of on-site disaster management.

Course Outcomes

CO1	Illustrate the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
CO2	Demonstrate the knowledge of basic emergency care and the prevention of harm to workers.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:**List of Practical**

1. Quality care: Standards and Norms
2. Quality care: to NABH guidelines
3. Assessment of vital signs Handmade Basic emergency care – first aid and triage
4. Demonstration of process of Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR, Use of AED (Automated external defibrillator).
5. Visit to Central Sterile Supply Department (CSSD), incinerator complex, Immunization section
6. Biomedical waste: types of container and colour coding
7. Demonstration of proper use of Personal protective equipment (PPE)
8. Demonstration of monitoring & controlling of cross infection (Protective devices)
9. Infection control programme: Guidelines (NABH and JCI) for Hospital Infection Control
10. Antibiotic sensitivity testing

Suggested Reading

- 1) CM Francis, Mario C De Souza. Hospital Administration, 3/e, 2004, JappeBrothers, ISBN9788171797219
- 2) Aspi F Golwalla, Sharukh A Golwalla. A Handbook of Emergencies, 8/e, 2015, JappeBrothers, ISBN9789351524724
- 3) Singh Anantpreet, Kaur Sukhjot, Biomedical Waste Disposal. 1/e, 2008, JappeBrothers, ISBN97893502555

Suggested Reading

- M. Dena Gardiner. Principles of Exercise Therapy 4th edition, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
- Margaret Hollis & Phyl Fletcher Cooks. Practical Exercise Therapy 4th edition, Wiley Publishers, 1999, ISBN: 9780632049738
- Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
- Pamela K Levangie, Cynthia C Norkins. Joint Structure and Function: A Comprehensive Analysis 5th edition, , F. A. Davis Company, 2010, ISBN: 978-0803623620

Name of The Course	Introduction to quality and patient safety(lab)			
Course Code	BPHY3011			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

The student is expected to study:

Name of The Course	CLINICAL OBSERVATION (PROJECT)			
Course Code	BPHY 3012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	5	2.5

Course Objectives

1.To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the under-graduate program and across their career

2.To ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bedside demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers.
CO2	Understanding the bedside assessment of a patient or to the course of the disease
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation.
CO5	Understanding basic knowledge of exercise therapy and its implementation

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
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50	00	00	50
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Course Contents:

Unit-1

The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre, PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.

Unit-2

The student will also be briefed regarding information about a patient's clinical status including signs, symptoms, and course of a disease

Unit-3

Clinical visit to their respective professional department within the hospital.

Unit-4

The students will learn about the construction and principle of working of various electrotherapeutic modalities and will be explained the indications, contraindications and harmful effects of the same. They will be taught to perform a check for all modalities. This will enable the students to apply these modalities for therapeutic purpose efficiently.

Unit-5

Develop the skills of the students in areas like assessment of physical parameters (joint range of motion, muscle strength etc) and principles of exercise therapy (strengthening, stretching, goniometry etc) and its application.

Suggested Reading

Text Book (s):

- Textbook of rehabilitation by S. Sunders

- **Tidy's Physiotherapy, 12th edition, Ann M. Thomson, Alison T. Skinner, Joan Piercy, Butterworth-Heinemann, 1991, ISBN: 978-0750613460**
- Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
- **Val Robertson, Alex Ward, John Low, Ann Reed. Electro therapy explained: Principles & practice 4th edition, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437**

Course Outcomes

CO 1	To demonstrate knowledge and understanding of specific exercise & PNF.
CO 2	To utilize the knowledge of Suspension therapy, Hydrotherapy & Functional Re-education Exercises.
CO 3	Apply the knowledge of Aerobic & Stretching Exercises.
CO 4	To utilize the knowledge of Manual therapy & Peripheral joint mobilization.
CO 5	Demonstrate application of Balance & co-ordination, posture & walking aids.
CO 6	Evaluate recent advances in exercise therapy

Reference Book (s)

- **Susan L. Michlovitz. Thermal Agents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653**
- **David J. Magee. Orthopedic Physical Assessment 5th edition, Elsevier Health Sciences, 2008, ISBN: 978-0721605715**

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	-	50	100

Course Content:

<p>Unit I: Introduction to specific exercise & PNF</p> <p>12 Hours</p> <ul style="list-style-type: none"> • Specific exercise regimens <ol style="list-style-type: none"> Isotonic: de Lormes, Oxford, MacQueen, Circuit weight training Isometric: BRIME (Brief Resisted Isometric Exercise), Multiple Angle Isometrics Isokinetic regimens <p>Proprioceptive Neuromuscular Facilitation</p> <p>. Techniques of facilitation</p> <ol style="list-style-type: none"> Mobility: Contract relax, Hold relax, Rhythmic initiation Strengthening: Slow reversals, repeated contractions, timing for emphasis, rhythmic stabilization Stability: Alternating isometric, rhythmic stabilization Skill: timing for emphasis, resisted progression <p>Endurance: slow reversals, agonist reversal</p>
<p>Unit II: Suspension therapy, Hydrotherapy, Functional Re-education & Individual and Group Exercises</p> <p>12 Hours</p> <ul style="list-style-type: none"> • Suspension Therapy <ol style="list-style-type: none"> Definition, principles, equipment & accessories, Indications & contraindications, Benefits of suspension therapy Types of suspension therapy: axial, vertical, pendular <p>Techniques of suspension therapy for upper limb</p> <p>Techniques of suspension therapy for lower limb</p>

Course Code	BPHY 4001			
Name of Course	Exercise Therapy			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	5	0	0	5

Course Objectives

To study:

1. Various methods of assessment of the physical parameters like joint ROM, muscle strength etc
2. The principles of exercise therapy e.g. co-ordination, re-education, strengthening, mobilization.

<ul style="list-style-type: none"> Hydrotherapy a. Definitions, Goals and Indications, Precautions and Contraindications, Properties of water, use of special equipment, techniques, Effects and uses, merits and demerits. Functional Re-education a. Lying to sitting: Activities on the Mat/Bed, Movement and stability at floor level; Sitting activities and gait; Lower limb and Upper limb activities. <p>Individual and Group Exercises a. Advantages and Disadvantages, Organization of Group exercises, Recreational Activities and Sports</p>
<p>Unit III: Aerobic & Stretching Exercises</p> <p style="text-align: center;">12 Hours</p>
<ul style="list-style-type: none"> Aerobic Exercise a. Definition and key terms; Physiological response to aerobic exercise, Examination and evaluation of aerobic capacity – Exercise Testing, Determinants of an Exercise Program, The Exercise Program, Normal and abnormal response to acute aerobic exercise, Physiological changes that occur with training, Application of Principles of an Aerobic conditioning program for patients – types and phases of aerobic training. <p>Stretching a. Definition of terms related to stretching; Tissue response towards immobilization and elongation, Determinants of stretching exercise, Effects of stretching, Inhibition and relaxation procedures, Precautions and contraindications of stretching, Techniques of stretching</p>
<p>Unit IV: Manual therapy & Peripheral joint mobilization</p> <p style="text-align: center;">12Hours</p>
<ul style="list-style-type: none"> Manual Therapy & Peripheral Joint Mobilization a. Schools of Manual Therapy, Principles, Grades, Indications and Contraindications, Effects and Uses – Maitland, Kaltenborn, Mulligan b. Biomechanical basis for mobilization, Effects of joint mobilisation, Indications and contraindications, Grades of mobilization, Principles of mobilization, Techniques of mobilization for upper limb, lower limb, Precautions. <p>Basics in Manual Therapy & Applications with Clinical reasoning a. Examination of joint integrity i. Contractile tissues ii. Non contractile tissues b. Mobility - assessment of accessory movement & End feel c. Assessment of articular & extra-articular soft tissue status i. Myofascial assessment ii. Acute & Chronic muscle hold iii. Tightness iv. Pain-original & referred d. Basic principles, Indications & Contra-Indications of mobilization skills for joints & soft tissues. i. Maitland ii. Mulligan iii. Mckenzie iv. Muscle Energy Technique v. Myofascial stretching vi. Cyriax vii. Neuro Dynamic Testing</p>
<p>Unit V: Balance & co-ordination, posture & walking aids</p> <p style="text-align: center;">12Hours</p>

<ul style="list-style-type: none"> Balance - Definition a. Physiology of balance: contributions of sensory systems, processing sensory information, generating motor output b. Components of balance (sensory, musculoskeletal, biomechanical) c. Causes of impaired balance, Examination & evaluation of impaired balance, Activities for treating impaired balance: mode, posture, movement, Precautions & contraindications, Types Balance retraining. Co-ordination Exercise a. Anatomy & Physiology of cerebellum with its pathways Definitions: Co-ordination, Inco-ordination b. Causes for Inco-ordination, Test for co-ordination: equilibrium test, non-equilibrium test Principles of co-ordination exercise. c. Frenkel's Exercise: uses of Frenkel's exercise, technique of Frenkel's exercise, progression, home exercise. Posture a. Definition, Active and Inactive Postures, Postural Mechanism, Patterns of Posture, Principles of re-education: corrective methods and techniques, Patient education. Walking Aids a. Types: Crutches, Canes, Frames; Principles and training with walking aids.
<p>Unit VI: Recent Advances in exercise therapy</p> <p style="text-align: right;">8hours</p>
<p>Use of technobody for gait rehabilitation Recent advances in exercise prescription Rehabilitation Robotics Cupping therapy</p>

Suggested Reading

- 1.M. Dena Gardiner. Principles of Exercise Therapy 4th edition, , CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939**
- Margaret Hollis &Phyl Fletcher Cooks. Practical Exercise Therapy 4th edition, Wiley Publishers, 1999, ISBN: 9780632049738**
- Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747**

Name of The Course	BIOPHYSICS (THEORY)
Course Code	BPHY4002
Prerequisite	
Corequisite	

Antirequisite				
	L	T	P	C
	1	0	0	1

Course Objective:

To Study

- To understand the concept and basic principles to know electrotherapy equipment is given under this topic.
- The student will be taught about physics related to electrotherapy and application on human body tissues.

Course Outcomes

CO1	To demonstrate knowledge and understanding of physical principles ,structure and properties of matter and electricity.
CO2	To apply the principles magnetism & Ohm's law , A.C & D.C Current
CO3	To utilize the knowledge of current electricity and its chemical effects in human body.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Contents:

<p>Unit I: Physical principle and electrical supply 8 hours</p> <ul style="list-style-type: none"> ❖ Structure and properties of matter-solids, liquids and gases, adhesion, surface tension, viscosity, density and elasticity. ❖ Structure of atom, molecules, elements and compound ❖ Electricity: Definition and types. Therapeutic uses. Basic physics of

construction. Working & Importance of currents in treatment.

- ❖ Static Electricity: Production of electric charge. Characteristic of a charged body & Characteristics of lines of forces. Potential energy and factors on which it depends. Potential difference and EMF.
- ❖ Current Electricity: Units of Electricity: farad, Volt, Ampere, Coulomb, Watt , Condensers: Definition, principle, Types- construction and working, capacity & uses
- ❖ Brief outline of main supply of electric current
- ❖ Dangers-short circuit, electric shocks: Micro/ Macro shocks
- ❖ Precaution-safety devices, earthing, fuses etc.
- ❖ First aid and initial management of electric shock
- ❖ Burns: electrical & chemical burns, prevention and management

Unit II MAGNETISM.

7 hours

- ❖ Magnetism: Definition. Properties of magnets. Electromagnetic induction. Transmission
 - by contact. Magnetic field and magnetic forces. Magnetic effects of an electric field.
- ❖ Conductors, Insulators, Potential difference, Resistance and intensity
- ❖ Ohm's law and its application to DC and AC currents. Fuse: construction, working and
 - application.
- ❖ Transmission of electrical energy through solids, liquids, gases and vacuum.
- ❖ Rectifying Devices-Thermionic valves, Semiconductors, Transistors, Amplifiers,
 - transducer and Oscillator circuits.
- ❖ Display devices and indicators-analogue and digital.
- ❖ Transformer: Definition, Types, Principle, Construction, Eddy current, working uses

❖ Chokes: Principle, Construction and working, Uses

Suggested Reading

- Val Robertson, Alex Ward, John Low, Ann Reed. Electro therapy explained: Principles & practice 4th edition, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437
- Sheila Kitchen, Sarah Bazin. Electrotherapy : Evidence Based Practice 11th edition, Churchill Livingstone, 2002, ISBN: 9780443072161
- M.H. Cameron. Physical Agents in Rehabilitation: From Research to Practice 4th edition, Saunders, 2012, ISBN: 978-1455728480
- Susan L. Michlovitz. Thermal Agents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653
- Angela Forster. Clayton's Electrotherapy: Theory & Practice 8th edition, CBS Publishers & Distributors, 2007, ISBN: 978-8123908595
- Joseph Kahn. Principles and Practice of Electro Therapy 4th edition, Churchill Livingstone, 2000, ISBN: 978-0443065538
- Roger M. Nelson, Karen W Hayes, Dean P. Currier. Clinical Electrotherapy 3rd edition, Appleton & Lange publishers, 1999, ISBN: 9780838514917

Name of The Course	Electrotherapy (LMHF & Equipment care)			
Course Code	BPTY4003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	5	0	0	5

Course Objective:

1. To study about the Principles, Techniques, Effects, Indication and Contra-Indication of various therapeutic modalities.
2. To study about the importance of dosage parameter of various electro therapeutic modalities in the restoration of physical function.

Course Outcomes

CO1	To apply the principles of therapeutic low frequency currents in clinical practice.
CO2	To apply the principles of common electrodiagnostic tools for clinical evaluation.
CO3	To apply the principles of therapeutic medium frequency currents in clinical practice.
CO4	To determine the therapeutic effects, methods of application, dosimetry, indication and contraindication of High frequency currents.
CO5	To determine the therapeutic effects, methods of application, indication and contraindication of superficial and deep heating modalities.
CO6	Unit 6 - Recent advances in Electrotherapy (8hours)

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-1: Introduction to Low frequency Currents

- A. Basic types of current
 - a. Direct Current: types, physiological & therapeutic effects
 - b. Alternating Current
- B. Types of Current used in Therapeutics
 - a. Modified D.C
 - i. Faradic Current
 - ii. Galvanic Current
 - b. Modified A.C

- i. Sinusoidal Current
 - ii. Diadynamic Current.
- C. Sinusoidal Current & Diadynamic Current
- D. HVPGS – Parameters & its uses
- E. Ionization/Iontophoresis: Techniques of Application of Current, Commonly used Ions (Drug)
- F. Cathodal / Anodal galvanism.
- G. Micro Current & Macro Current
- H. Types of Electrical Stimulators
 - a. NMES- Construction component.
 - b. Neuro muscular diagnostic stimulator
 - c. Components and working Principle
- I. Principles of Application: Electrode tissue coupling, Electrode, Size & Placement of Electrode - coupling, Current flow in tissues, Lowering
- J. Nerve Muscle Physiology: Action Potential Propagation of Action Potential, Motor unit of Healthy Muscle, Stimulation of Denervated Repair.
- K. TENS: Define TENS, Types of TENS, Conventional TENS, Brief & Intense TENS, Modulation of TENS, Placement of Electrodes, Dosage parameters, Indications & Contraindications.
 - i. Pain: Define Pain, Theories of Pain, theory in detail.

Unit-2: Electro-diagnosis

- A. SD Curve: Methods of Plotting SD Curve, Application in innervated Muscle, Characters of Partially Denervated Muscle, Chronaxie & Rheobase.
- B. Nerve conduction velocity studies
- C. EMG: Construction of EMG equipment.
- D. Bio-feedback.

Unit-3: Medium Frequency

- A. Interferential Therapy: Define IFT, Principles of IFT, Placement in IFT,
 - a. Dynamic Interference system, Dosage
 - b. Physiological & Therapeutic effects
- B. Russian Current
- C. Rebox type Current

Unit- 4: Thermo & Actinotherapy (High Frequency Currents)		Cyclotherm: Principles of production, Therapeutic uses, Contraindications.
A. Electro Magnetic Spectrum.		
B. SWD: Define shortwave, Frequency Wavelength of SWD, Production of SWD, Circuit diagram & Production of SWD, Methods of Heat Production by SWD treatment, Types of SWD Electrode, Placement & Spacing of Electrodes, Bathing & Contraindications.		
C. Pulsed Electro Magnetic Energy: Principles, Production & Uses of a. PEME.		
D. Micro Wave Diathermy: Define Microwave, Wave length & Frequency, Production of MW, a. Applicators, Dosage Parameters, Physiological Indications & b. Contraindications, Dangers of MWD. [2 Hours]		
E. Ultrasound: Define Ultrasound, Frequency, Piezo Electric Production of US, Treatment Dosage parameters: Continuous & Pulsed mode; Intensity, US Fields: Near field, Far field, Half value distance, Attenuation, Coupling Media, Thermal effects, Non-thermal effects, Principles of contact, Water bag, Water bath, Solid sterile gel pack method for wound application with dosages.		
F. IRR: Define IRR, wavelength & parameters, Production of IR, Physiological & Therapeutic effects, Duration & frequency of treatment, Indication & Contraindication. [2 Hours]		
G. UVR: Define UVR, Types of UVR, UVR generators; High pressure mercury vapour lamp, Water cooled mercury vapour lamp, Fluorescent tube, Theraktin tunnel, PUVA apparatus. Physiological & Therapeutic effects. Sensitizers & Filters. Test dosage calculation. Calculation of E1, E2, E3, E4 doses, Indications, contraindications. Dangers. Dosages for different therapeutic effects. Distance in UVR lamp [8 Hours]		
H. LASER: Define LASER. Types of LASER. Principles of Production of LASER by various methods. Methods of application of LASER. Dosage of LASER. Physiological & Therapeutic effects of LASER. Safety precautions of LASER. Classifications of LASER. Energy density & power density [8 Hours]		
UNIT-5 Superficial heating Modalities		
A. Wax Therapy: Principle of Wax Therapy application – latent Heat, Composition of Wax Bath Therapy unit, Methods of application of Wax, Physiological & Therapeutic effects, Indications & Contraindication, Dangers.		
B. Contrast Bath: Methods of application, Therapeutic uses, Indications & Contraindications.		
C. Moist Heat Therapy: Hydro collator packs in brief, Methods of application, Therapeutic uses, Indications & Contraindications.		

- Angela Forster. Clayton's Electrotherapy: Theory & Practice 8th edition, CBS Publishers & Distributors, 2007, ISBN: 978-8123908595
- Joseph Kahn. Principles and Practice of Electrotherapy 4th edition, Churchill Livingstone, 2000, ISBN: 978-0443065538
- Roger M. Nelson, Karen W Hayes, Dean P. Currier. Clinical Electrotherapy 3rd edition, Appleton & Lange publishers, 1999, ISBN: 9780838514917

CO 3	Apply the knowledge of Aerobic & Stretching Exercises.
CO 4	To utilize the knowledge of Manual therapy & Peripheral joint mobilization.
CO 5	Demonstrate application of Balance & co-ordination, posture & walking aids
CO 6	Application of weight loss training for obese

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1.	To demonstrate various PNF techniques
2	To demonstrate techniques of strengthening of muscles using resisted exercises
3	To demonstrate the technique of suspension therapy for mobilizing and strengthening joints and muscles
4	To demonstrate techniques for functional re-education
5	To demonstrate the techniques for muscle stretching
6	To demonstrate techniques for measuring limb length and body circumference

Name of The Course	Exercise Therapy (Lab)				
Course Code	BPHY4004				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	T	P	C	
	0	0	1	3.5	

Course Objectives

To study:

- Various methods of assessment of the physical parameters like joint ROM, muscle strength etc
- The principles of exercise therapy e.g. co-ordination, re-education, strengthening, mobilization, Goniometry.

Course Outcomes

CO 1	To demonstrate knowledge and understanding of specific exercise & PNF.
CO 2	To utilize the knowledge of Suspension therapy, Hydrotherapy & Functional Re-education Exercises

7	To demonstrate mobilization of individual joint regions
8	To demonstrate the technique of measuring ROM using goniometry
9	To demonstrate muscle strength using the principles and technique of MMT
10	To demonstrate the techniques for muscle strengthening based on MMT grading
11	To demonstrate the techniques of massage and manipulations
12	To demonstrate exercises for weight loss training

2nd revised edition, Churchill Livingstone, 1988, ISBN: 978-0443037207

- David J. Magee. **Orthopedic Physical Assessment 5th edition**, Elsevier Health Sciences, 2008, ISBN: 978-0721605715
- Margaret Knott, Ionta Voss, James W. Myers, Dorothy E. Voss. **Proprioceptive Neuromuscular Facilitation: Patterns and Techniques 3rd revised edition**, Lippincott Williams and Wilkins, 1985, ISBN: 978-00614259

Name of The Course	BIOPHYSICS (lab)			
Course Code	BPT4005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

To study

- To understand the concept and basic principles to know electrotherapy equipments is given under this topic.
- The student will be taught about physics related to electrotherapy and application on human body tissues.

Course Outcomes

CO1	To utilize the knowledge of current electricity and its chemical effects in human body tissue.
CO2	Apply the knowledge of electrical supply and their dangers, precaution, first aid and initial management of electric shock.

Text Book (s)

- M. Dena Gardiner. **Principles of Exercise Therapy 4th edition**, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
- Margaret Hollis & Phyl Fletcher Cooks. **Practical Exercise Therapy 4th edition**, Wiley Publishers, 1999, ISBN: 9780632049738
- Carolyn Kisner, Lynn Allen Colby. **Therapeutic Exercise: Foundations and Techniques 6th edition**, F.A. Davis Company, 2012, ISBN: 978-0803625747

Reference Books:

- M. Lacote, A.M. Chevalier, A. Miranda, J.P. Bleton, P. Stevenin. **Clinical Evaluation of Muscle Function**

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Contents:

List of Experiments

1	Electricity : Definition and types, therapeutic uses. Basic Physics of construction working.
2	To understand the basic principle of Magnetism, its transmission , magnetic field, effects and forces
3	Ohms law , its application to AC and DC currents. Fuse: construction ,working and application.
4	To understand electro magnetic Radiation its physical principle and their relevance to physiotherapy practice
5	To understand electric currents its physical principle and their relevance to physiotherapy practice
6	To understand about the thermal agents its physical principle, transmission , difference between superficial and deep heat.
7	To understand about electric shock, causes, types and precautions.
8	To understand about Earthing.

9	To understand about Electric currents.
10	To understand about first aid and initial management.

Suggested Reading

- Val Robertson, Alex Ward, John Low, Ann Reed. Electrotherapy explained: Principles & practice 4th edition, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437
- Sheila Kitchen, Sarah Bazin. Electrotherapy: Evidence Based Practice 11th edition, Churchill Livingstone, 2002, ISBN: 9780443072161
- M.H. Cameron. Physical Agents in Rehabilitation: From Research to Practice 4th edition, Saunders, 2012, ISBN: 978-1455728480.
- Susan L. Michlovitz. Thermal Agents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653
- Angela Forster. Clayton's Electrotherapy: Theory & Practice 8th edition, CBS Publishers & Distributors, 2007, ISBN: 978-8123908595
- Joseph Kahn. Principles and Practice of Electro Therapy 4th edition, Churchill Livingstone, 2000, ISBN: 978-0443065538
- Roger M. Nelson, Karen W Hayes, Dean P. Currier. Clinical Electrotherapy 3rd edition, Appleton & Lange publishers, 1999, ISBN: 9780838514917

Name of The Course	Electrotherapy (LMHF & Equipment care) (Lab)
Course Code	BPHY4006

Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	8	4

Course Objectives

The student is expected to study:

- The use of electrotherapy modalities applying the principles of electrotherapy with proper techniques, dosimetry and safety precautions.
- The application of various electrotherapy modalities their indications, contraindications, precautions and harmful effects.

Course Outcomes

CO1	To apply the therapeutic currents clinically
CO2	To demonstrate the knowledge in application of ultraviolet radiations
CO3	To apply the knowledge in application of LASER therapy
CO4	To demonstrate and apply the knowledge in application of superficial and deep heating modalities.
CO5	To apply the proper testing of Electrotherapy modalities in clinical settings.
CO6	To discuss recent advances in electrotherapy.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical

1. Demonstrate the technique for patient evaluation – receiving the patient and positioning the patient for treatment using electrotherapy.
2. Collection of materials required for treatment using electrotherapy modalities and testing of the apparatus.
3. Electrical stimulation for the muscles supplied by the peripheral nerves
4. Plotting of SD curve with chronaxie and rheobase and demonstrate FG test
5. Application of Ultrasound for different regions- various methods of application
6. Demonstrate treatment techniques using SWD, IRR and Microwave diathermy and technique of UVR exposure for various conditions – calculation of test dose
7. Demonstrate treatment method using IFT for various regions
8. Calculation of dosage and technique of application of LASER
9. Technique of treatment and application of Hydrocollator packs, cryotherapy, contrast bath, wax therapy, whirl pool bath and Faradism under Pressure for UL and LL
10. Equipment care -
 - a) Checking of equipments
 - b) Arrangement of exercise therapy and electrotherapy equipment.
 - c) Calibration of equipment
 - d) Purchase, billing, document of equipment.
 - e) Safety handling of equipments.
 - f) Research lab equipment maintenance.
 - g) Stock register, movement register maintenance
11. Demonstrate application of TENS: Types of TENS, Conventional TENS, and Acupuncture TENS, Burst TENS, Brief & Intense TENS, Modulated TENS. Types of Electrodes & Placement of Electrodes, Dosage parameters, Physiological & Therapeutic effects, Indications & Contraindications.

12. Demonstrate application of Ultrasound: Frequency, Piezo Electric effects: Direct, Reverse, Production of US, Treatment Dosage parameters: Continuous & Pulsed mode, Intensity, US Fields.

Suggested Reading

Text Book (s)

- Val Robertson, Alex Ward, John Low, Ann Reed. Electrotherapy explained: Principles & practice 4th edition, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437
- Sheila Kitchen, Sarah Bazin. Electrotherapy: Evidence Based Practice 11th edition, Churchill Livingstone, 2002, ISBN: 9780443072161
- M.H. Cameron. Physical Agents in Rehabilitation: From Research to Practice 4th edition, Saunders, 2012, ISBN: 978-1455728480.

Reference Book (s)

- Susan L. Michlovitz. Thermal Agents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653
- Angela Forster. Clayton's Electrotherapy: Theory & Practice 8th edition, CBS Publishers & Distributors, 2007, ISBN: 978-8123908595
- Joseph Kahn. Principles and Practice of Electrotherapy 4th edition, Churchill Livingstone, 2000, ISBN: 978-0443065538
- Roger M. Nelson, Karen W Hayes, Dean P. Currier. Clinical Electrotherapy 3rd edition, Appleton & Lange publishers, 1999, ISBN: 9780838514917

Name of The Course	Medical Physiotherapy Law and Ethics			
Course Code	BPHY4007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. To study the various legal and ethical medical practice
2. To study how to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice

Course Outcomes

CO1	To utilize knowledge for medical ethics and law
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CO2	To understand the development of standardised protocols and medicolegal aspects.
CO3	To understand the code of ethics and law for physiotherapist

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit I: Introduction 10hours
1. Medical ethics versus medical law - Definition - Goal - Scope 2. Introduction to Code of conduct 3. Basic principles of medical ethics – Confidentiality 4. Malpractice and negligence - Rational and irrational drug therapy
Unit II: Understanding the right of patients 10Hours
1. Autonomy and informed consent - Right of patients 2. Care of the terminally ill- Euthanasia 3. Organ transplantation
Unit III: Development of standardised protocols and code of ethics and law for physiotherapist 10 Hours:
1. Code of ethics for physiotherapists 2. Ethics documents for physiotherapists 3. Laws affecting physiotherapy practice

Suggested Reading

- Reflections on Medical Law and Ethics in India Board book by Bismi Gopalakrishnan, Mercy Khaute, B. Sandeepa Bhat
- Medical Negligence and the Law in India: Duties, Responsibilities, Rights by Tapas Kumar Koley
Medical Law and Ethics by Jonathan Herring
Contemporary Issues in Healthcare Law and Ethics (Aupha/Hap Book) by Dean Harris
PARIKHS TEXTBOOK OF MEDICAL JURISPRUDENCE FORENSIC MEDICINE AND TOXICOLOGY FOR CLASSROOMS AND COURTROOMS 7ED (PB 2017) (Old Edition) by SUBRAHMANYAM B.V.

Name of The Course	CLINICAL EDUCATION (project)			
Course Code	BPHY4008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	6	3

Course Objectives

- Approach to patient, collection of demographic data, art of history taking and bedside / OPD manners in relation to patient, general assessment of patient from therapeutic point of view, reaching to provisional diagnosis, and testing of therapeutic skill learned.
- The student will be posted in the department of Physiotherapy & he/she will learn the assessment, diagnosis, & physiotherapy treatment of patients visiting the department.

Course Outcomes

CO1	To demonstrate an understanding of patient's problem and chief complaint.
CO2	To demonstrate the clinical special tests for various musculoskeletal and neurological conditions.
CO3	To employ the best treatment method on patients to achieve a favourable outcome.
CO4	To demonstrate teamwork, leadership, better understanding of

	the situation and professional qualities in OPD and IPD setups.
CO5	To demonstrate work ethics and maintain records of the patients for future use and follow-up.
Co6	To Practice the techniques of physiotherapy

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Contents:

<p>Unit-1 Clinical Assessment and examination of Upper limb</p>
<p>Clinical Assessment and examination of shoulder complex, Clinical Assessment and examination of elbow, Clinical Assessment and examination of wrist joint,</p>
<p>Unit-2 Clinical Assessment and examination of Lower limb</p> <p>Clinical Assessment and examination of hip joint, Clinical Assessment and examination of knee joint, Clinical Assessment and examination of foot & ankle complex,</p>

Unit-3 Clinical Assessment and examination of Spine

Clinical Assessment and examination of upper cervical spine, Clinical Assessment and examination of lower cervical spine, Clinical Assessment and examination of lumbar spine,

Unit-4 Neurological Examination

Assessment of higher mental functions, history taking, sensory assessment, motor assessment

Unit-5

Case study

Unit 6

8 hours

Hands on practice

- **Mobilization**
- **Kinesiology taping**
- **Mulligan technique**

- **workshop to be attended on**
- PNF
- Recent advances in the field of physiotherapy

- **Topic presentation**
- Case presentation
- Presentation on new researches in the field of physiotherapy

Suggested reading:

Text Book (s):

Orthopaedic physical Assessment by David

Magee, 6th edition, Elsevier India(2014)

Reference Book (s)

Textbook of Orthopaedics by John

Ebnezar, Jaypee Brothers Medical Publishers

Name of The Course	BPHY 5001			
Course Code	Clinical orthopaedics & traumatology			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

1. The fractures and deformities of upper and lower limb
2. The spinal deformities

Course Outcomes

CO1	To relate the concept of fractures.
CO2	To interpret the soft tissue injuries and degenerative and rheumatic diseases.
CO3	To interpret the spinal conditions and infectious diseases of musculoskeletal system.
CO4	To interpret the congenital malformations and developmental diseases of skeleton.
CO5	To interpret the neurovascular and neuromuscular conditions and amputation.
CO6	To Propose recent advances in orthopedics

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to Traumatology & Orthopedic Surgeries 14 Hours

- ❖ Introduction to orthopedics
- ❖ Clinical examination in an orthopedic patient
- ❖ Common investigative procedures
- ❖ Radiological and Imaging techniques in Orthopedics
- ❖ Inflammation and repair, Soft tissue healing
- ❖ Fracture: definition, types, signs and symptoms.
- ❖ Fracture healing
- ❖ Complications of fractures.
- ❖ **Conservative and surgical approaches**
- ❖ Principles of management – reduction (open/closed, immobilization etc.)
- ❖ Subluxation/ dislocations – definition, signs and symptoms, management (conservative and operative)
- ❖ **Orthopedic Surgeries:**
 - Indications
 - Classification
 - Types
 - **Principles of management of the following Surgeries:**
 - i. Arthrodesis
 - ii. Arthroplasty (partial and total replacement)
 - iii. Osteotomy
 - iv. External fixators
 - v. Spinal stabilization surgeries (Harrington's, Luque's, Steffi plating) etc.
 - vi. Limb re attachments.

Unit II: Fractures and Dislocations of Upper Limb, Lower Limb & Spine 14 Hours

- ❖ **Fractures of Upper Limb:**
 - Causes
 - Clinical features
 - Mechanism of injury
 - Complications
 - **Conservative and surgical management of the following fractures:**
 - i. Fractures of clavicle and scapula
 - ii. Fractures of greater tuberosity and neck of humerus.
 - iii. Fracture shaft of humerus.
 - iv. Supracondylar fracture of humerus.
 - v. Fractures of capitulum, radial head, olecranon, coronoid, and epicondyles
 - vi. Side swipe injury of elbow
 - vii. Both bone fractures of ulna and radius
 - viii. Fracture of forearm – Monteggia, Galeazzi fracture – dislocation
 - ix. Chauffeur's fracture
 - x. Colle's fracture
 - xi. Smith's fracture
 - xii. Scaphoid fracture.
 - xiii. Fracture of the metacarpals
 - xiv. Bennett's fracture
 - xv. Fracture of the phalanges. (Proximal and middle)

❖ **Dislocations of Upper Limb:**

- i. Anterior dislocation of shoulder – mechanism of injury, clinical feature, complications, conservative management (Kocher’s and Hippocrates maneuver), surgical management (putti plat, bankart’s) etc.
- ii. Recurrent dislocation of shoulder
- iii. Posterior dislocation of shoulder – mechanism of injury, clinical features and management.
- iv. Posterior dislocation of elbow – mechanism of injury, clinical feature, complications & management

❖ **Fracture of Pelvis and Lower Limb:**

- Causes
 - Clinical features
 - Mechanism of injury
 - Complications
 - **Conservative and surgical management of the following fractures:**
 - i. Fracture of pelvis
 - ii. Fracture neck of femur – classification, clinical features, complications, management - conservative and surgical
 - iii. Fractures of trochanters
 - iv. Fracture shaft femur—clinical features, mechanism of injury, complications, management-conservative and surgical
 - v. Supracondylar fracture of femur
 - vi. Fractures of the condyles of femur
 - vii. Fracture patella
 - viii. Fractures of tibial condyles
 - ix. Both bones fracture of tibia and fibula
 - x. Dupuytren’s fracture
 - xi. Maisonneuve’s fracture
 - xii. Pott’s fracture – mechanism of injury, management
 - xiii. Bimalleolar fracture
 - xiv. Trimalleolar fracture
 - xv. Fracture calcaneum – mechanism of injury, complications and management
 - xvi. Fracture of talus
 - xvii. Fracture of metatarsals—stress fractures joints fracture
 - xviii. Fracture of phalanges
- ❖ **Dislocations of Lower Limb:**
- Mechanism of injury
 - Clinical features
 - Complications
 - **Management of the following dislocations of lower limb:**
 - i. Anterior dislocation of hip
 - ii. Posterior dislocation of hip
 - iii. Central dislocation of hip

- iv. Dislocation of patella
- v. Recurrent dislocation of patella

❖ **Fracture of Cervical Spine**

- Mechanism of injury
- Clinical feature
- Complications (quadriplegia)
- Management- immobilization (collar, cast, brace, traction)
- Management for stabilization
- Management of complication (bladder and bowel, quadriplegia)
 - i. Clay shoveller’s fracture
 - ii. Hangman’s fracture
 - iii. Fracture odontoid
 - iv. Fracture of atlas

❖ **Fracture of Thoracic and Lumbar Regions:**

- Mechanism of injury
- Clinical features
- Management— conservative and surgical of common fractures around thoracic and lumbar regions

❖ **Fracture of coccyx**

Fracture of Rib Cage - Mechanism of injury, clinical features, management for Fracture ribs, fracture of sternum.

Unit III: Regional Disorders & Pathologies

13 Hours

❖ **Spinal Pathologies:**

- Causes
- Clinical feature
- Patho-physiology
- Investigations
- **Management-Medical and surgical for the following:**
 - i. Prolapsed intervertebral disc (PID)
 - ii. Spinal Canal Stenosis
 - iii. Spondylosis (cervical and lumbar)
 - iv. Spondylolysis
 - v. Spondylolisthesis
 - vi. Lumbago/ Lumbosacral strain
 - vii. Sacralisation
 - viii. Lumbarisation
 - ix. Coccydynia
 - x. Hemivertebra

❖ **Regional Conditions**

- Definition
- Clinical features
- **Management of the following regional conditions:**
 - a. **Shoulder:**
 - i. Periarthritic shoulder (adhesive capsulitis)
 - ii. Rotator cuff tendinitis
 - iii. Supraspinatus Tendinitis

- iv. Infraspinatus Tendinitis
- v. Bicipital Tendinitis
- vi. Subacromial Bursitis
- b. Elbow:**
 - i. Tennis Elbow
 - ii. Golfer's Elbow
 - iii. Olecranon Bursitis (student's elbow)
 - iv. Triceps Tendinitis.
- c. Wrist and Hand:**
 - i. De Quervain's Tenosynovitis
 - ii. Ganglion
 - iii. Trigger Finger/ Thumb
 - iv. Mallet Finger
 - v. Carpal Tunnel Syndrome
 - vi. Dupuytren's Contracture
- d. Pelvis and Hip:**
 - i. IT Band Syndrome
 - ii. Piriformis Syndrome
 - iii. Trochanteric Bursitis
- e. Knee:**
 - i. Osteochondritis Dissecans
 - ii. Prepatellar and Suprapatellar Bursitis
 - iii. Popliteal Tendinitis
 - iv. Patellar Tendinitis
 - v. Chondromalacia Patella
 - vi. Plica Syndrome
 - vii. Fat Pad Syndrome (Hoffa's syndrome)
- f. Ankle and Foot:**
 - i. Ankle Sprains
 - ii. Plantar Fasciitis / Calcaneal Spur
 - iii. Tarsal Tunnel Syndrome
 - iv. Achilles Tendinitis
 - v. Metatarsalgia
 - vi. Morton's Neuroma
- ❖ **Syndromes**
 - Causes
 - Clinical features
 - Complications
 - **Management- conservative and surgical of the following:**
 - i. Cervico brachial syndrome
 - ii. Thoracic outlet syndrome
 - iii. Vertebro- basilar syndrome
 - iv. Scalenus syndrome
 - v. Costo clavicular syndrome
 - vi. Levator scapulae syndrome
 - vii. Piriformis syndrome.

Unit IV: Deformities & Diseases of Bones and Joints 10 Hours

- ❖ **Deformities**
 - Clinical features
 - Complications

- **Medical and surgical management of the following Congenital and Acquired deformities:**
 - ❖ **Congenital Deformities**
 - i. CTEV
 - ii. CDH
 - iii. Torticollis
 - iv. Scoliosis
 - v. Flat foot
 - vi. Vertical talus
 - vii. Hand anomalies- syndactyly, polydactyly and ectrodactyly
 - viii. Arthrogryposis multiplex congenita (amyoplasia congenita)
 - ix. Limb deficiencies- Amelia and Phocomelia, Klippel feil syndrome, osteogenesis imperfecta (fragile ossium)
 - x. Cervical rib
 - ❖ **Acquired Deformities**
 - i. Acquired Torticollis
 - ii. Scoliosis
 - iii. Kyphosis
 - iv. Lordosis
 - v. Genu varum
 - vi. Genu valgum
 - vii. Genu recurvatum
 - viii. Coxa vara
 - ix. Pes cavus
 - x. Hallux rigidus
 - xi. Hallux valgus
 - xii. Hammer toe
 - xiii. Metatarsalgia
- ❖ **Disease of Bones and Joints**
 - Causes
 - Clinical features
 - Complications
 - **Management- medical and surgical of the following conditions:**
 - ❖ **Infective conditions:**
 - i. Osteomyelitis (Acute / chronic)
 - ii. Brodie's abscess
 - iii. TB spine and major joints like shoulder, hip, knee, ankle, elbow etc.
 - ❖ **Arthritic conditions:**
 - i. Pyogenic arthritis
 - ii. Septic arthritis
 - iii. Syphilitic infection of joints
 - ❖ **Bone Tumors:**
 - Classification
 - Clinical features

- **Management - medical and surgical of the following tumors:**

- Osteoma
- Osteosarcoma
- Osteochondroma
- Enchondroma
- Ewing's sarcoma
- Giant cell tumor
- Multiple myeloma
- Metastatic tumors

- ❖ Perthes disease, Slipped Capital Femoral Epiphysis and Avascular Necrosis

- ❖ Metabolic Bone Diseases: Rickets, Osteomalacia, Osteopenia, Osteoporosis

- ❖ **Inflammatory and Degenerative Conditions:**

- Causes
- Clinical feature
- Complications
- Deformities
- Radiological features

- **Management- conservative and surgical for the following conditions:**

- Osteoarthritis
- Rheumatoid arthritis
- Ankylosing spondylitis
- Gouty arthritis
- Psoriatic arthritis
- Hemophilic arthritis
- Still's disease (juvenile rheumatoid arthritis)
- Charcot's joints
- Connective Tissue Disorders- Systemic Lupus Erythematosus, Scleroderma,
- Dermatomyositis, Poliomyelitis, Mixed connective tissue Disease (MCTD)

Unit V: Neuro-vascular & Neuromuscular diseases 10 Hours

- ❖ Definition
- ❖ Causes
- ❖ Clinical feature
- ❖ Complications
- **Management (Multidisciplinary approach) medical and surgical of the following conditions:**
 - Cerebral palsy
 - Poliomyelitis
 - Spinal Dysraphism
 - Leprosy

- ❖ **Soft Tissue Injuries**

- Define terms such as sprains, strains, contusion, tendinitis, rupture, tenosynovitis, tendinosis, bursitis
- Mechanism of injury of each
- Clinical features
- **Managements- conservative and surgical of the following soft tissue injuries:**

- Meniscal injuries of knee
- Cruciate injuries of knee
- Medial and lateral collateral injuries of knee
- Lateral ligament of ankle
- Wrist sprains
- Strains- quadriceps, hamstrings, calf, biceps, triceps etc.
- Contusions- quadriceps, gluteal, calf, deltoid etc.
- Tendon ruptures-Achilles, rotator cuff muscles, biceps, pectorals etc.

- ❖ **Hand Injuries**

- Mechanism of injury
- Clinical features
- Management of the following:

- Crush injuries
- Flexor and extensor injuries
- Burn injuries of hand

- ❖ **Amputations**

- Definition
- Levels of amputation of both lower and upper limbs, indications, complications

Unit VI: Recent advances in Orthopaedics 8 hours

- Electrotherapy
- Manual therapy
- Surgeries
- Rehabilitation.

Suggested Reading

- J. Maheshwari, Essential Orthopaedics 4th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2011, ISBN: 978-8184655421
- S. Brent Brotzman. Clinical Orthopaedic Rehabilitation: An Evidence-Based Approach 3rd edition, Robert C. Manske, Mosby Publishers, 2011, ISBN: 978-0323055901
- John Ebnezar. Text Book of Orthopaedics 4th edition, Boydell & Brewer Ltd, 2010, ISBN: 9788184487442
- David L. Hamblen, A.H.R.W. Simpson, John C. Adams. Adam's Outline of Fractures, including Joint Injuries 12th edition, Elsevier Health Sciences, 2007, ISBN: 9780443102974

5.Louis Solomon, David Warwick, SelvaduraiNayagam.
Apley's Concise System of Orthopaedics & Fractures 9th edition,
CRC Press, 2010, ISBN: 9780340942055

CO2	To demonstrate an understanding of surgical treatments in vascular disorders and the surgeries related to abdominal areas.
CO3	To utilize basic understanding of burns patient and different type of plastic surgery, Ophthalmological and ENT related conditions.
CO4	To utilize the basic anatomy for understanding and learning about Obstetrics and Gynecological conditions.
CO5	To utilize the knowledge of anatomy and physiology to understand the female reproductive organs, the surgeries related to it, the reproductive health, and the surgical approaches.
CO6	To Demonstrate the recent approach towards surgery.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to General Surgery	10 lectures
<ul style="list-style-type: none"> ❖ Surgery – definition, Reasons for Surgery; Anaesthesia and its types, its effects and complication on the patient. ❖ Brief description of Radiologic Diagnostic procedures, Endoscopy – types, Biopsy – uses and types. Overview and Drainage systems and tubes used in Surgery. ❖ Fluid, Electrolyte and Acid-Base disturbances – diagnosis and management ; Nutrition in the surgical patient ; ❖ Wound healing – definition, cause, clinical features, phases of wound healing, clinical management of wounds, factors affecting wound healing. ❖ Scars – types and treatment. ❖ Hemostasis – components, factors affecting bleeding during surgery. Transfusion therapy in surgery – blood components, complications of transfusion ; ❖ Definition, Indication, various Incisions and its types, indications, clinical presentation and Complications following Common operations like Cholecystectomy, Colostomy, Ileostomy, Gastrectomy, Hernias, Appendicectomy Mastectomy, Nephrectomy, Prostatectomy. General Post – Operative Complications and its management. 	

Name of The Course	GENERAL SURGERY INCLUDING BURNS, PLASTIC SURGERY AND OBSTETRICS AND GYNECOLOGY			
Course Code	BPHY5002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

- Principles of surgical examination.
- Brief description of various types of Surgeries, pathologies its etiology, clinical features and the management.
- The burns & plastic surgery patients and with amputation.
- The various common gynecological and obstetrics conditions and procedures.

Course Outcomes

CO1	To demonstrate knowledge and understanding of common surgical problems and the techniques used for assessments.
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Unit II: Chest wall and vascular disorders and surgeries	
10 lectures	
❖ Thoracic surgeries – Thoracotomy – Definition, Types of Incisions with emphasis to the site of incision, muscles cut and complications. Lung surgeries: Pneumectomy, Lobectomy, segmentectomy – Indications, Physiological changes and Complications; Thoracoplasty, Pleurectomy, Pleurodesis and Decortication of the Lung.	
❖ Cardiac surgeries – An overview of the Cardio-Pulmonary Bypass Machine – Extracardiac Operations, Closed Heart surgery, Open Heart surgery. Transplant Surgery – Heart, Lung– Indications, Physiological changes and Complications.	
❖ Chest trauma - Causes, Clinical Presentation, Diagnosis and treatment of the following Thoracic Trauma situations – Airway obstruction, Pneumothorax, Hemothorax, Cardiac Tamponade, Tracheobronchial disruption, Aortic disruption, Diaphragmatic disruption, Esophageal disruption, Cardiac and Pulmonary Contusions. Disorders of the Chest Wall, Lung and Mediastinum	
❖ Diseases of the Arteries and Veins : Definition, Etiology, Clinical features, signs and symptoms, complications, management and treatment of following diseases : Arteriosclerosis, Atherosclerosis, Aneurysm, Buerger's disease, Raynaud's Disease, Thrombophlebitis, Deep Vein Thrombosis, Pulmonary Embolism, Varicose Veins.	
Unit III: Burn, ENT, and ophthalmology and oncology	
10 lectures	
❖ Burn: Definition, Classification, Causes, Prevention, Pathological changes, Complications, Clinical Features and Management. Skin Grafts – Types, Grafting Procedures, Survival of Skin Graft ; Flaps – Types and uses of Flaps.	
❖ ENT: Common problems of ear, otitis media, Otosclerosis, functional achonia and deafness, management facial palsy classification, medical and surgical management of lower motor neuron type of facial palsy.	
❖ Ophthalmology: brief description of various Ophthalmologic surgical conditions	
❖ Surgical Oncology – Cancer – definition, types, clinical manifestations of cancer, Staging of Cancer, surgical procedures involved in the management of cancer.	
Unit IV: Obstetrics and Gynecology	
8 lectures	
❖ Brief description of Anatomy and physiology of the female reproductive organs.	
❖ Hormonal disorders of females	
❖ Pregnancy - Diagnosis of pregnancy, Abortion, Physiological changes during pregnancy, High risk pregnancy, prenatal common complications – investigation and management, Musculoskeletal disorders during pregnancy, Multiple child birth, Normal labor	
❖ Child birth complications, investigation and management	

❖ Normal puerperium, lactation and importance of post-natal exercises , antenatal care exercise	
❖ Family planning.	
Unit-V: Obstetrics and Gynecology disorders	
8 lectures	
❖ Medical termination of pregnancy	
❖ Infection of female genital tract including sexually transmitted diseases, low backache	
❖ Prolapse of uterus and vagina	
❖ Principle of common gynaecological operations – hysterectomy, D&C, D&E, PAP's smear	
❖ Menopause: Its effect on emotions and musculoskeletal system	
❖ Surgical procedures involving child birth.	
❖ Definition, Indications and Management of the following surgical procedures – pelvic repair, caesarian section, nephrectomy, Hysterosalphyngography, Dilatation and Curettage, Laproscopy, Colposcopy, Hysterectomy	
❖ Carcinoma of female reproductive organs – surgical management in brief Mastectomy – Simple, radical. Hysterectomy.	
❖ Incontinence – Types, Causes, Assessment and Management.	
❖	
Unit-VI: Recent Developments	
4 lectures	
❖ Recent Advancements in surgery	
❖ Recent radiological inventions in assessment	

Suggested Reading

1. Charles V. Mann, R. C. G. Russell. Bailey & Love's Short Practice of Surgery revised 21st edition, Charles V. Mann, R. C. G. Russell, Chapman & Hall, 1992, ISBN: 978-0442315849
2. S. Das. A Concise Text Book of Surgery 6th edition, Dr. Somen Das Publishers, 2008, ISBN: 978-8190568128
3. lecture notes on surgery by christopher
4. HiralalKonar. Dc Dutta's Text Book of Obstetrics 7th revised edition, Jaypee Brothers Medical Publishers, 2014, ISBN: 978-9351520672
5. A. K. Nan. Undergraduatessurgery 5th reprint, Academic Publishers, 2004, ISBN: 9788186358587
6. Margaret Polden, Jill Mantle. Physiotherapy in Obstetrics & Gynecology 1st edition, Butterworth-Heinemann, 1990, ISBN: 978-0750600163

Name of The Course	BPHY5003
Course Code	General Medicine, Paediatrics & psychiatry

Prerequisite	
Co-requisite	
Anti-requisite	
	L T P C
	4 0 0 4

Course Objectives

The graduate is expected to study:

- The nutritional and metabolic diseases
- The nutrition and immunization process and the clinical presentation of various pathologies in a pediatric patient
- The disorders of geriatrics

Course Outcomes

CO1	To relate the concept of various nutritional and metabolic diseases.
CO2	To interpret etiology, pathology, clinical features and treatment methods for various medical conditions
CO3	To relate the concept of growth, development, nutrition and immunization in children.
CO4	To interpret rheumatism and cardio-pulmonary ailments in paediatric patient
CO5	To interpret common disorders in a psychiatry patient.
CO6	To interpret etiology, pathology, clinical features and treatment methods for coronavirus.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<p>Unit I: Infection, Poisoning, and Food and nutrition</p> <p>1. Infection : Effects of Infection on the body – Pathology – source and spread of infection – vaccinations – generalized infections – rashes and infection – food poisoning and gastroenteritis – sexually transmitted diseases – HIV infections and Aids.</p> <p>2. Poisoning: Clinical features – general management – common agents in poisoning – pharmaceutical agents – drugs of misuse – chemical pesticides – Envenomation.</p> <p>3. Food and Nutrition: Assessment – Nutritional and Energy requirements; Deficiency diseases – clinical features and treatment; Protein – Energy Malnutrition: Clinical features and treatment; Obesity and its related disorders: Causes –</p>
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Complications – benefits of weight loss – management of Obesity – diet, exercise and medications.

Unit II: Endocrine diseases and disease of blood

1. Endocrine diseases: Common presenting symptoms of Endocrine disease – common classical disease presentations, clinical features and its management; Diabetes Mellitus: Etiology and pathogenesis of diabetes – clinical manifestations of the disease – management of the disease – Complications of diabetes.
2. Diseases of the blood: Examinations of blood disorders – Clinical manifestations of blood disease; Anemia – signs and symptoms – types and management ; Hemophilia - Cause – clinical features severity of disease – management – complications due to repeated hemorrhages – complications due to therapy.

Unit III: Diseases of the digestive system and Diseases of the Skin

1. Diseases of the digestive system : Clinical manifestations of gastrointestinal disease – Etiology, clinical features, diagnosis, complications and treatment of the following conditions : Reflux Oesophagitis, Achlasia Cardia, Carcinoma of Oesophagus, GI bleeding, Peptic Ulcer disease, Carcinoma of Stomach, Pancreatitis, Malabsorption Syndrome, Ulcerative Colitis, Peritonitis, Infections of Alimentary Tract ; Clinical manifestations of liver diseases - Aetiology, clinical features, diagnosis, complications and treatment of the following conditions : Viral Hepatitis, Wilson’s Disease, Alpha 1-antitrypsin deficiency, Tumors of the Liver, Gallstones, Cholecystitis.
2. Diseases of the Skin: Examination and clinical manifestations of skin diseases; Causes, clinical features and management of the following skin conditions: Leprosy, Psoriasis, Pigmentary Anomalies, Vasomotor disorders, Dermatitis, Coccal and Fungal Parasitic and Viral infections

Unit IV: Pediatrics

Pediatrics : Problems and management of LBW infants, Perinatal problems and management,

Congenital abnormalities and management, Respiratory conditions of childhood, Cerebral Palsy

- ❖ causes, complications, clinical manifestations, treatment ; Spina Bifida – management and treatment, Epilepsies – types, diagnosis and treatment; Recognizing developmental delay, common causes of delay ; Orthopedic and Neuromuscular disorders in childhood, clinical features and management ; Sensory disorders – problems resulting from loss of vision and hearing ; Learning and behavioural problems – Hyperactivity, Autism, Challenging behaviours, Educational delay, The Clumsy Child.

Unit V: Psychiatric Disorders

Psychiatric Disorders: Classifications, Causes, Clinical manifestations and treatment methods used in Psychiatry. Modalities of psychiatric treatment, Psychiatric illness and physiotherapy, Brief description of Etio-pathogenesis, manifestations, and management of psychiatric illnesses-. Anxiety neurosis, Depression, Obsessive compulsive neurosis, Psychosis, Manic-depressive psychosis, Post-traumatic stress disorder, Psychosomatic reactions: Stress and Health, theories of Stress – Illness.

Etio-pathogenesis, manifestations, and management of psychiatric illness

- a. Drug dependence and alcoholism,
- b. Somatoform and Dissociate Disorders – conversion reactions, Somatization, Dissociate Amnesia, and Dissociate Fugue,
- c. Personality disorders
- d. Child psychiatry - manifestations, and management of childhood disorders - attention deficit syndrome and behavioral disorders.
- e. Geriatric psychiatry.

Unit VI: Coronavirus

1. Coronavirus : Clinical manifestation, etiology and treatment.
2. Combination of medication for symptomatic treatment for coronavirus.
 - ❖ Combination of medication for preventive treatment of coronavirus for frontline doctors.

1. Christopher Haslett, Sir Stanley Davidson. Davidson's Principles & Practice of Medicine 18th edition, Churchill Livingstone, 1999, ISBN: 978-0443059445
2. O.P. Ghai, Piyush Gupta, V.K. Paul. Ghai's Essential Pediatrics 6th edition revised & enlarged, CBS Publishers, ISBN: 9788123911632
3. Dennis L. Kasper, Eugene Braunwald, Stephen Hauser, Dan Longo, J. Larry Jameson, Anthony S. Fauci. Harrison's Principles of Internal Medicine 16th edition, McGraw-Hill Professional, 2004, ISBN: 978-0071402354
4. Suraj Gupte. The Short Textbook of Pediatrics 11th edition, 2009, ISBN: 978-81-8448-469-4
5. K.V. Krishna Das. Text Book of Medicine (vol. I & II) 5th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2008, ISBN: 978-81-8448-388-8
6. Margaret Polden, Jill Mantle. Physiotherapy in Obstetrics & Gynecology 1st edition, Butterworth-Heinemann, 1990, ISBN: 978-0750600163

Name of The Course	Community Medicine			
Course Code	BPHY 5004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

1. To introduce the concept of health care and management issues in Health Services.
2. To help them in assuming a leadership role in their profession and assume the responsibility of guidance.
3. To help them assume wider responsibilities at all levels of health services.
4. To help them in improving their performance through better understanding of the health services at all the levels of community.

Course Outcomes

CO1	Infer healthy lifestyles in the individual and the community level to prevent
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Suggested Reading

	environmental degradation and to promote social harmony.
CO2	Demonstrate patient-centred comprehensive primary health care including referral, continuing care and follow-up.
CO3	Apply the basic epidemiological principles to investigation of diseases, outbreaks, health promotion and disease prevention
CO4	Identify the health needs of populations and population subgroups through planning, intervention, monitoring and evaluation
CO5	Infer to health systems' performance as a member of the health team in the generation and efficient utilization of human and logistic resources.
CO6	Acquire the Skills of the Clinical Examination of Pelvic floor.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-I : Health, Disease & Education	12 hours
<p>Health & Disease :</p> <ul style="list-style-type: none"> • Definitions • Concepts • Dimensions and Indicators of Health • Concept of well-being • Spectrum and Determinants of Health • Concept and natural history of Disease • Concepts of disease control and prevention • Modes of Intervention • Population Medicine • The role of socio-economic and cultural environment in health and disease <p>Health Education :</p> <ul style="list-style-type: none"> • Concepts • Aims and objectives 	

<ul style="list-style-type: none"> • Approaches to health education • Models of health education • Contents of health education • Principles of health education <p>Practice of health education.</p>
<p>Unit-II Types of Health 12 hours</p> <p>Mental Health :</p> <ul style="list-style-type: none"> • Characteristics of a mentally healthy person • Types of mental illness • Causes of mental ill health • Prevention • Mental health services • Alcohol and drug dependence • Emphasis on community aspects of mental health • Role of Physiotherapist in mental health problems such as mental retardation. <p>Occupational Health :</p> <ul style="list-style-type: none"> • Occupational environment • Occupational hazards • Occupational diseases • Prevention of occupational diseases • Social security and other measures for the protection from occupational hazard accidents and diseases • Details of compensation acts <p>Nutrition & Health :</p> <ul style="list-style-type: none"> • Classification of foods • Nutritional profiles of principal foods • Nutritional problems in public health • Community nutrition programmes <p>Environment & Health :</p> <ul style="list-style-type: none"> • Components of environment • Water and air pollution and public health • Pollution control • Disposal of waste • Medical entomology
<p>Unit III: Epidemiology 12 hours</p> <p>Epidemiology :</p> <ul style="list-style-type: none"> • Definition and scope

- Principles of Epidemiology and Epidemiological methods
- Components and Aims
- Basic measurements and methods
- Uses of Epidemiology
- Infectious disease epidemiology
- Dynamics and modes of disease transmission
- Host defenses and Immunizing agents
- Hazards of Immunization
- Disease prevention and control
- Disinfection, Screening for Disease: Concept of screening, Aims and Objectives, uses and types of screening

Epidemiology of Communicable Disease :

- Respiratory infections
- Intestinal infections
- Arthropod-borne infections
- Zoonoses, Surface infections
- Hospital acquired infections

Epidemiology of non-communicable diseases and conditions :

- Cardio vascular diseases
- Coronary heart disease
- Hypertension
- Stroke
- Rheumatic heart disease
- Cancer
- Diabetes
- Obesity
- Blindness
- Accidents and Injuries

Unit IV: Health Planning

12 hours

Demography & Family planning :

- Demographic cycle
- Fertility
- Family planning-objectives of national family planning programme and family planning methods
- General idea of advantage and disadvantages of the methods

Preventive Medicine in Obstetrics, Paediatrics & Geriatrics :

- MCH problems
- Antenatal, Intranatal and post-natal care
- Care of children
- Child health problems
- Rights of child and National policy for children
- MCH services and indicators of MCH care
- Social welfare programmes for women and children
- Preventive medicine and geriatrics

Hospital Waste Management :

- Sources of hospital waste
- Health hazards
- Waste management

Disaster Management :

- Natural and man-made disasters
- Disaster impact and response
- Relief phase
- Epidemiologic surveillance and disease control
- Nutrition
- Rehabilitation
- Disaster preparedness

Unit V: Health Management & Programmes

12 hours

Public Health Administration :

- Overview of the health administration set up at Central and state levels
- National health programme-highlighting the role of social, economic and cultural factors in the implementation of the national programmes
- Health problems of vulnerable groups-pregnant and lactating women, infants and pre-school children, occupational groups

Health Programmes in India :

- Vector borne disease control programme
- National leprosy eradication programme
- National tuberculosis programme

- National AIDS control programme
- National programme for control of blindness
- Iodine deficiency disorders (IDD) programme
- Universal Immunisation programme
- Reproductive and child health programme
- National cancer control programme
- National mental health programme
- National diabetes control programme
- National family welfare programme
- National sanitation and water supply programme
- Minimum needs programme

Unit VI: Socio-Economical & Cultural issues related to morbidity owing to physical disability 8 hours

- Health Problem in Vulnerable Groups:
- Pregnant & Lactating Women, Pelvic floor dysfunction, Urinary incontinence
- Pre-term Babies with high risk, Infants & Pre-School Children-Brain Damage, During Birth Injury.

Suggested Reading

1. Park's Textbook of Preventive & Social Medicine - K. Park
2. Textbook of Preventive & Social Medicine - P.K. Mahajan & M.C. Gupta
3. Essential of Community Medicine - Baride and Kulkarni
4. Textbook of Community Medicine Preventive and Social Medicine 4th edition, CBS Publishers & Distributors Pvt. Ltd., eISBN: 9788123927220
5. Community Medicine with Recent Advances, Jaypee Brothers Medical Publisher

Name of The Course	EVALUATION METHODS AND OUTCOME MEASURES
Course Code	BPTY5005

Prerequisite	
Co-requisite	
Anti-requisite	
	L T P C
	2 0 0 2

Course Objectives

- To describe and compare different health outcomes measures
- To describe and compare different methods used to value health states
- To analyze health outcomes data

Course Outcomes

CO1	Reflect on, evaluate and explain all stages of the physiotherapy process based on theoretical and practical knowledge, and assess if the patient should be referred to another care provider
CO2	To reflect on different perspectives, preferences, when valuing and treating in rehabilitation of psychosomatic problems
CO3	To reflect focus on physiotherapy examination, assessment and treatment in rehabilitation of diseases/injuries in the nervous system

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit I: The physiotherapy process and ICF concerning disability
<ol style="list-style-type: none"> 3. The physiotherapy process and ICF concerning disability, functioning and contextual factors including behavioral medical aspects in rehabilitation in different rehabilitation contexts 4. The role of the physiotherapist as caregiver, educationalist, consultant and team member 5. Evidence-based working method (published knowledge, best practice, the patient's wishes and available resources) 6. Contraindications for different examination and treatment methods 7. Gender, culture, diversity, laws and regulations and ethical rules 8. Physical activity in rehabilitation

Unit II: Physiotherapy examination, assessment and treatment in rehabilitation of psychosomatic problems

- Psychosomatic approach treatment, reflection and communication psychosomatic orientated examination with an emphasis on resource- and problem analysis psychosomatic-targeted treatment methods; body awareness, therapeutic touch, relaxation and stress management
- Motor control as a theoretical model for clinical practice, sensory motor control, cognitive functions and communication, condition and strength and ADL ability, participation in the rehabilitation process. Orthotic devices, wheelchairs and other aids

Unit III: Evidence-based physiotherapy working method

- Different competence areas in clinical context
- B. Evidence-based physiotherapy working method in injuries and diseases in the musculoskeletal system, the nervous system and in psychosomatic problems

Suggested Reading

- Borg, Jörgen Rehabiliteringsmedicin : [teori och praktik] Lund : Studentlitteratur, 2006 - 344 s.ISBN:91-44-04507-7
- Trew, M; Everett, T.Human movement 5th ed. : Elsevier, London : 2005ISBN:0443074461
- Kaltenborn, Freddy M.; Evjenth, Olaf Manual mobilization of the joints: the Kaltenborn method of joint examination and treatment.n Vol. 2,p The spine 4. ed. : Oslo : Olof Norlis bokhandel, 2003 - 336 s.ISBN:82-7054-069-2
- Magee, David J.Orthopedic physical assessment 4. ed.: Philadelphia, PA : Saunders, 2002 - 1020 s.ISBN:0-7216-9352-0 LIBRIS-ID:8302787
- Nyman, Håkan; Bartfai, AnikoKlinisk neuropsykologi Lund : Studentlitteratur, 2000 - 363 s.ISBN:91-44-01328-0
- Physical management for neurological conditionsStokes, Maria; Stack, Emma 3rd ed. : Edinburgh : Churchill Livingstone, 2011ISBN:978-0-7234-3560-0

Name of The Course	DIAGNOSTIC IMAGING FOR PHYSIOTHERAPIST			
Course Code	BPHY5006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

To study

- 1.various diagnostic imaging procedures.
- 2.To study the importance of nuclear medicine.

Course Outcomes

CO1	To illustrate the indications and implications of commonly used diagnostic imaging tests.
CO2	To demonstrate the common diagnostic and therapeutic imaging procedures.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit-1: Introduction to Diagnostic imaging

- History , How a Medical Image Helps ,What Imaging Studies Reveal related to
- Radiography(x-rays) ,Fluoroscopy, Computed Tomography, MRI, Ultrasound Endoscopy.

Procedure and importance of Ultrasound, Endoscopy

- Indications and contraindications
- Equipment used
- How it helps in diagnosis
- The Findings
- Benefits versus Risks and Costs.
-

Unit II: Radiography, Mammography and nuclear medicine

- Equipment components,
- Procedures for Radiography & Mammography
- Benefits versus Risks and Costs
- Equipment used for Nuclear Medicine.
- Indications and Contra-indications
- How it helps in diagnosis.
- Benefits versus Risks and Costs.

Suggested Reading

1. Livingstone, ISBN 978-94-009-8785-2
2. James Swain Kenneth Bush Juliette Broising. Diagnostic Imaging for Physical Therapists, Saunders, 1st Edition,2008ISBN: 9781416029038

3. G Balachandran. MRI Spine in Low Backache Made Easy: for the General Practitioner, 1/e, 2012, Jaypee Brothers, ISBN: 9789350257142
4. Govind B Chavan. MRI Made Easy (for Beginners), 2/e, 2013, Jaypee Brothers, ISBN: 9789350902707
5. Joseph H Introcaso. Musculoskeletal Ultrasound. 3/e, 2016, Jaypee Brothers, ISBN: 9789351529330

Name of The Course	GENERAL SURGERY INCLUDING BURNS, PLASTIC SURGERY AND OBSTETRICS AND GYNECOLOGY – LAB			
Course Code	BPHY5007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

The student is expected to study:

1. Principles of surgical examination.
2. Brief description of various types of Surgeries, pathologies its etiology, clinical features and the management.
3. The burns & plastic surgery patients and with amputation

Course Outcomes

CO1	To demonstrate knowledge and understanding of common surgical problems and the techniques used for assessments.
CO2	To demonstrate an understanding of surgical treatments in vascular disorders and the surgeries abdominal areas, ENT surgeries

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practicals	11 Hours
<ol style="list-style-type: none"> 1. To study about incisions, its types and uses. 2. To study about Burn its classification and rules to calculate TBSA. 3. To study about various diagnostic procedure in surgery. 4. To study about various surgeries of abdomen. 5. To study about various surgeries of heart. 6. To study about various surgeries of lungs. 7. To study about antenatal and post natal exercises. 8. To study about various changes during pregnancy. 9. To study about various surgical procedure and complications of gynecological operations 10. To study about Incontinence, its types and management. 	

Suggested Reading

1. Lab Manual
2. Charles V. Mann, R. C. G. Russell. Bailey & Love's Short Practice of Surgery revised 21st edition, Charles V. Mann, R. C. G. Russell, Chapman & Hall, 1992, ISBN: 978-0442315849
3. S. Das. A Concise Text Book of Surgery 6th edition, Dr. Somen Das Publishers, 2008, ISBN: 978-8190568128
4. lecture notes on surgery by christopher
5. Hiralal Konar. Dc Dutta's Text Book of Obstetrics 7th revised edition, Jaypee Brothers Medical Publishers, 2014, ISBN: 978-9351520672
6. A. K. Nan. Undergraduatessurgery 5th reprint, Academic Publishers, 2004, ISBN: 9788186358587
7. Margaret Polden, Jill Mantle. Physiotherapy in Obstetrics & Gynecology 1st edition, Butterworth-Heinemann, 1990, ISBN: 978-075060016

Name of The Course	BPHY5008			
Course Code	General Medicine, Paediatrics & psychiatry (Lab)			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

The student is expected to study:

1. Basic principles of assessment and application of physical therapy in treatment of various nutritional and metabolic diseases
2. The nutrition and immunization process and the clinical presentation of various pathologies in a paediatric patient
3. Basic principles of assessment and application of physical therapy in treatment of various disorders of geriatrics

Course Outcomes

CO1	To relate the concept of various physiotherapy treatment of nutritional, endocrine diseases and metabolic diseases.
CO2	To relate the concept of physiotherapeutic treatments for skin diseases.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practicals:
Practical 1: Precautions, contraindications and rehabilitation for Eating disorders.
Practical 2: General exercises for weight gain and weight loose.
Practical 3: Fitness education.
Practical 4: Physiotherapeutic rehabilitation, exercise protocol, precaution and contraindication for diabetes mellitus.
Practical 5: Physiotherapeutic rehabilitation, exercise protocol, precaution and contraindication for bed ridden patients.
Practical 6: Rehabilitation of leprosy: tendon replacement rehabilitation, modalities, splinting, muscular and scar rehabilitation.
Practical 7: Perinatal problems and management
Practical 8: Congenital abnormalities and management, Respiratory Orthopedic and Neuromuscular rehabilitation in Cerebral Palsy.

Practical 9: management of childhood disorders- attention deficit syndrome and behavioral disorders

Practical 10: psychosomatic management of Geriatric psychiatric illness:- Anxiety neurosis, Depression, Obsessive compulsive neurosis, Psychosis, Manic-depressive psychosis, Post-traumatic stress disorder, Psychosomatic reactions: Stress and Health, theories of Stress –Illness.

Suggested Reading

1. Christopher Haslett, Sir Stanley Davidson. Davidson's Principles & Practice of Medicine 18th edition, Churchill Livingstone, 1999, ISBN: 978-0443059445
2. O.P. Ghai, Piyush Gupta, V.K. Paul. Ghai's Essential Pediatrics 6th edition revised & enlarged, CBS Publishers, ISBN: 9788123911632
3. Dennis L. Kasper, Eugene Braunwald, Stephen Hauser, Dan Longo, J. Larry Jameson, Anthony S. Fauci. Harrison's Principles of Internal Medicine 16th edition, McGraw-Hill Professional, 2004, ISBN: 978-0071402354
4. Suraj Gupte. The Short Textbook of Pediatrics 11th edition, 2009, ISBN: 978-81-8448-469-4
5. K.V. Krishna Das. Text Book of Medicine (vol. I & II) 5th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2008, ISBN: 978-81-8448-388-8

Name of The Course	EVALUATION METHODS AND OUTCOME MEASURES (lab)			
Course Code	BPHY5009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. To describe and compare different health outcomes measures
2. To describe and compare different methods used to value health states
3. To analyze health outcomes data

Course Outcomes

CO1	Reflect on, evaluate and explain all stages of the physiotherapy process based on theoretical and practical knowledge, and assess if the patient should be referred to another care provider
CO2	To reflect on the choice of different methods when valuing musculoskeletal issues

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

<ol style="list-style-type: none"> 1. The physiotherapy process and ICF concerning disability, functioning and contextual, factors. 2. The role of the physiotherapist as caregiver, educationalist, consultant and team member 3. Evidence-based working method (published knowledge, best practice, the patient's wishes and available resources) 4. Contraindications for different examination and treatment methods 5. Gender, culture, diversity, laws and regulations and ethical rules 6. Physical activity in rehabilitation 7. Movement habits and body positions, as well as behaviours and reference to problems triggering or tending to maintain pain conditions principles of differential diagnoses concerning joint, muscle and nerve involvement 8. Hyper- and hypomobility and their causes 9. Muscle function regarding strength, endurance, coordination, muscle length and pain treatment with devices and orthopedic technical aids 10. Psychosomatic approach treatment, reflection and communication psychosomatic orientated examination with an emphasis on resource- and problem analysis psychosomatic-targeted treatment methods; body awareness, therapeutic touch, relaxation and stress management

Name of The Course	CLINICAL EDUCATION
Course Code	BPHY5010
Prerequisite	
Co-requisite	
Anti-requisite	

	L	T	P	C
	3	0	0	3

Course Objectives

The student is expected to study:

1. Approach to patient, collection of demographic data, art of history taking and bedside / OPD manners in relation to patient, general assessment of patient from therapeutic point of view, reaching to provisional diagnosis, and testing of therapeutic skill learned.

2. The student will be posted in the department of Physiotherapy & he/she will learn the assessment, diagnosis, & physiotherapy treatment of patients visiting the department.

Course Outcomes

CO1	Demonstrate an understanding of patient's problem and chief complaints.
CO2	Demonstrate an understanding of orthopaedic assessment.
CO3	Illustrate the clinical special tests for various musculoskeletal conditions.
CO4	Develop knowledge of various musculoskeletal conditions.
CO5	Develop knowledge of handling different cases.
CO6	Choose recent advancement in the field.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit I: General Assessment
<ul style="list-style-type: none"> • Demographics • History taking • Motor assessment • Sensory assessment
Unit II: Orthopaedic assessment
<ul style="list-style-type: none"> • Pain assessment • Motor assessment: muscle strength testing, ROM, muscle flexibility testing, end-feel • Sensory assessment: reflexes, sensations

<ul style="list-style-type: none"> • Gait • Balance • Posture
Unit III: Special tests
<ul style="list-style-type: none"> • upper limb: shoulder, elbow, wrist & hand • lower limb: hip, knee, ankle & foot • spine • upper limb tension tests • lower limb tension tests
Unit IV: Special areas
<ul style="list-style-type: none"> • low back pain • shoulder impingement • tennis elbow • osteoarthritis • ankle sprain
Unit V: Case studies
<ul style="list-style-type: none"> • knowledge of various musculoskeletal conditions
Unit VI: Recent trends in the field 8 hours
Discussion of high impact article related to clinical physiotherapy

Suggested Reading

1. Orthopaedic physical Assessment by David Magee, 6th edition, Elsevier India (2014)

2. Textbook of Orthopaedics by John Ebnezar, Jaypee Brothers Medical Publishers

Name of The Course	PT in Ortho and Sports			
Course Code	BPHY 6001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

- The fractures and deformities of upper and lower limb
- The spinal deformities
- The congenital deformities
- Amputations

Course Outcomes

CO1	To be able to identify disabilities due to various musculoskeletal dysfunction
CO2	To plan and set treatment goals
CO3	To apply the skills gained in exercise therapy in clinical situation
CO4	To apply the skills gained in electro therapy in clinical situations
CO5	To apply the skills of physiotherapy in different sports condition
CO6	To acquire the skills of the clinical examination of sports injury

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-I : Fractures	12 hours
<ul style="list-style-type: none"> • Types, classification, signs and symptoms, complications • Fracture healing-factors affecting fracture healing. 	

- Principles of fracture management - reduction - open and closed, immobilization-sling, cast, brace, slab, traction-manual, mechanical, skin, skeletal, lumbar and Cervical traction, external fixation, functional cast bracing.
- PT management in early and late complications of Frature
- Physiotherapy assessment and management in fracture cases
- PT assessment and management of upper limb fractures and dislocations. PT assessment and management of lower limb fractures and dislocations including pelvis. PT assessment and management spinal fractures.
- Principles of various schools of thought in manual therapy. (Briefly Maitland and McKenzie).

Unit II: Inflammatory Condition & Deformities 12 hours

Degenerative and inflammatory conditions:

- Definition, signs and symptoms, clinical features, pathophysiology, radiological features, deformities, medical, surgical management.
- PT assessment and management and home program for the following conditions – Osteoarthritis - emphasis mainly on knee, hip and hand, Rheumatoid Arthritis, Ankylosing spondylitis, Gout, Perthes disease, Periarthritic shoulder.

Infective conditions:

- Definition, signs and symptoms, clinical features, pathophysiology, radiological features, medical, surgical management.
- Describe PT assessment and management for following conditions – Osteomyelitis – acute and chronic, Septic arthritis, pyogenic arthritis, TB spine and major joints - knee and hip.

Deformities

- Causes, signs and symptoms, radiological features, medical and surgical management.

- Describe the PT. assessment and management of the following conditions: Congenital: CTEV, CDH, Torticollis, pes planus, pes cavus and other common deformities. Acquired: scoliosis, kyphosis, coxa vara, genu varum, valgum and recurvatum.
- Postural abnormalities of spinal column, clinical features, deformities, medical surgical and PT management.

Unit III: Neurological Conditions & Amputation 12 hours

Neurological Condition

- Cerebral palsy: Definition, etiology, classification, clinical features, complications, deformities, medical and surgical management and home program with special emphasis on carrying techniques. PT assessment and management after surgical corrections of the following neurological conditions:
 1. Cerebral Palsy
 2. Poliomyelitis
 3. Leprosy
 4. Spinal conditions (Cervical spondylosis, Lumbar spondylosis, Spondylolisthesis, Spinal canal stenosis, Spondylolysis, Sacroiliac joint dysfunction, Sacralisation, Lumbarisation, Intervertebral disc prolapse, Coccydynia, Spina bifida occulta.)

Spinal Traction

- Effects of spinal traction, types of traction, modes of application, indications for spinal traction, contraindications, precautions, limitations of traction.

Amputations:

- Definition, levels, indications, types, PT assessment, aims, management pre and post operatively. PT management with

emphasis on stump care and bandaging. Pre and post prosthetic training, checking out prostheses, complications of amputations and its management.

Unit IV: Orthopaedics Surgeries for Upper-Limb 12 hours

Osteoporosis

- causes, predisposing factors, investigations and treatment.

Orthopedic surgeries:

- Pre and post-operative PT assessment, goals, precautions and PT management of following surgeries such as: Arthrodesis, Osteotomy, Arthroplasty - partial and total - Excision arthroplasty, excision arthroplasty with implant, interpositional arthroplasty and total replacement; Tendon transplant, Soft tissue release - tenotomy, myotomy, lengthening; Arthroscopy, Spinal stabilization, Re-attachment of limbs, External fixators, Synovectomy.

Shoulder Joint

- Shoulder instabilities, TOS, RSD, Impingement syndrome - conservative and post-operative PT management. Total shoulder replacement and Hemi replacement. - Post operative PT management.
- AC joint injuries - rehabilitation. Rotator cuff tears - conservative and surgical repair. Subacromial decompression - Postoperative PT management.

Elbow and forearm

- Excision of radial head - Post operative PT management. Total elbow arthroplasty - Post operative PT management.

Wrist and Hand

- Total wrist arthroplasty. Repair of ruptured extensor tendons. Carpal tunnel syndrome. Flexor and extensor tendon lacerations - Postoperative PT management.

Unit V: Orthopedics surgeries for Lower Limbs 12 hours

Hip

- Joint surgeries- hemi and total hip replacement - Post operative PT management Tendonitis and bursitis. -Management.

Knee

- Lateralretinacularrelease,chondroplasty- Postoperativemanagement.Realignmentof extensor mechanism. ACL and PCL reconstruction surgeries - Post operative rehabilitation. Meniscectomy and meniscal repair - Post operative management. Plica syndrome, patellar dysfunctionandHoffa'ssyndrome- conservativemanagement.TKR- rehabilitationprotocol. Patellar tendon ruptures and Patellectomy-rehabilitation.

Ankleandfoot

- Ankleinstability.Ligamentoustears- Postoperativemanagement

Introduction to Bio-Engineering

- Classification of Orthoses and prostheses;
- Biomechanical principles and designing of orthoticandprostheticapplication;

SportsPhysiotherapy:

- Physicalfitness.
- Soft tissue injuries
- Soft tissue healing

CollateralandCruciateinjuriesofknee.

Meniscalinjuriesofknee.SupraspinatusandBicipit altendonitis.PrepatellarandSub-acromial

Unit VI: Sports Medicine 8 hours

- Introduction and Classification of Sports Injury
- Prevention of Sports Injury
- Investigation and Assessment in Sports Injury

- S. Brent Brotzman. Clinical Orthopaedic Rehabilitation: An Evidence-Based Approach 3rd edition, Robert C. Manske, Mosby Publishers, 2011, ISBN: 978-0323055901

Suggested Reading

- J. Maheshwari, Essential Orthopaedics 4th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2011, ISBN: 978-8184655421

Name of The Course	BPHY6002			
Course Code	Physiotherapy in general medicine and surgery			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

The student is expected to study:

1. Acquire knowledge of rationals of basic investigative approaches in the medical system and surgical intervention, regimes in general surgeries.
2. Execute effective physiotherapeutic measures (with appropriate clinical reasoning) and exercise, conditioning in general medical and surgical conditions.
3. Acquire the knowledge of various conditions where physiotherapy plays a vital role in the rehabilitation.

Course Outcomes

CO1	Understand the importance of pre and post op physiotherapy in rehabilitation
CO2	Demonstrate an understanding of surgical treatments and the surgeries related to abdominal areas including physiotherapy intervention
CO3	Demonstrate a basic understanding of burn management and role of physiotherapy in reconstructive surgery.
CO4	Utilize the knowledge of anatomy and physiology to understand the female reparoductive organs and the surgeries related to it, physiotherapy approaches and role of exercises in various stages of pregnancy
CO5	Utilize the role and knowledge of physiotherapy in various medical conditions including geriatrics.
CO6	Outline the recent advancements in surgical processes and tools.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to surgical and medical physiotherapy condition
<ul style="list-style-type: none"> ❖ Physiotherapy in pre and post-operative stages. ❖ Patient education and advice General physiotherapy intervention
Unit II: Physiotherapy in abdominal Surgeries
<ul style="list-style-type: none"> ❖ Abdominal incisions and its classification ❖ General abdominal surgeries - oesophagus, stomach, duodenum ❖ Operations on large and small intestine – Appendisectomy, cholecystectomy, partial colectomy, ileostomy, hernia and herniotomy, hernioraphy, hernioplasty. ❖ Postoperative exercises after abdominal surgeries
Unit III: Physiotherapy in burn and Plastic surgeries
<ul style="list-style-type: none"> ❖ Burns and its treatment – physiotherapy in burns, skin grafts, and reconstructive surgeries. ❖ Management of wound ulcers- Care of ulcers and wounds, Care of surgical scars ❖ U.V.R and other electro therapeutics for healing of wounds, prevention of Hyper-Granulated Scars Keloids. ❖ Electrotherapeutics measures for relief of pain during mobilization of scars tissues
Unit IV: Physiotherapy in Obstetrics and Gynaecology
<ul style="list-style-type: none"> ❖ Ante and post-natal management ❖ Common gynaecological condition and its management (prolapsed uterus, urogenital dysfunction, incontinence etc.) ❖ Surgeries of pelvic floor (hysterectomy etc.)
Unit V: Physiotherapy in geriatrics and general medical condition
<ul style="list-style-type: none"> ❖ Geriatrics – handling of old patients and their problems ❖ Physiotherapy in dermatological condition:Hyperhydrosis, leprosy, infected wound ulcers etc. ❖ Physiotherapy in ENT conditionssinusitis, non-suppurative and chronic suppurative otitis media, labyrinthitis, mastoidectomy, chronic rhinitis, laryngectomy, pharyngeo – laryngectomy, facia palsy.
Unit VI: Recent advancements in surgical technologies

- ❖ Physiotherapy in post operative complications.
- ❖ Advancement in surgical tools: MARVEL (Multi-Angle Rear-Viewing Endoscopic tool), magnifying loupes, Surgical robots with artificial intelligence.
- ❖ **Recent technologies: Orthobiologic Technologies for healing process**, 3-D printing applications in orthopaedic surgeries, **Smart Sensor-Enabled (HARDI)**.

Suggested Reading

1. Tidy's physiotherapy. Porter, Stuart B., and Noël M. Tidy. 2013. Edinburgh: Elsevier.
2. Physiotherapy in Medical Conditions Suraj Kumar BPT MPT Phd
3. Physiotherapy in surgical conditions: Pushpalmitra
4. Cash's textbook of general medical and surgical conditions for physiotherapists Joan E Cash; Patricia A Downie Philadelphia : Lippincott, ©1984.
5. Margaret Polden, Jill Mantle. Physiotherapy in Obstetrics & Gynecology 1st edition, Butterworth-Heinemann, 1990, ISBN: 978-0750600163

	management of pediatric neurological conditions and various neuro-surgical procedures.
CO6	Elaborate the recent advances in neuro diagnostic imaging and their functioning.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Clinical examination of neurological patients

Neurological assessment

- Principles of clinical diagnosis, higher mental function, assessment of brain & spinal cord function, evaluation of cranial nerves and evaluation of autonomic nervous system.
- Assessment of visual function
- Disorders of function in the context of Pathophysiology, Anatomy in Neurology and Cortical Mapping.
- Classification of neurological involvement depending on level of lesion

Investigations

- principles, methods, views, normal/abnormal values/features, types of following investigative procedures- skull x-ray, CT, MRI, evoked potentials, lumbar puncture, CSF examination, EMG, NCV.

Deafness, vertigo, and imbalance

- Physiology of hearing, disorders of hearing, examination & investigations of hearing, tests of vestibular function, vertigo, peripheral vestibular disorders, central vestibular vertigo.

Cerebro-vascular diseases

- Stroke, TIA, RIA, stroke in evolution, multi infarct dementia and Lacunar infarct. Classification of stroke – Ischemic, hemorrhagic, venous infarcts.

Head injury: Etiology, classification, clinical signs & symptoms, investigations, differential diagnosis, medical management, surgical management and complications

Unit II: Inflammatory conditions

Movement disorders

- Parkinson's disease, Dystonia, Chorea, Ballism, Athetosis, Tics, Myoclonus and Wilson's disease.

Infections of brain and spinal cord

- Meningitis, Encephalitis, Poliomyelitis and Post-polio syndrome. Complications of systemic infections on nervous system – Septic encephalopathy, AIDS, Rheumatic fever, Brucellosis, Tetanus, and Pertussis.

Name of The Course	BPHY6003			
Course Code	Clinical neurology & neurosurgery			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

The student is expected to study:

- The clinical examination of a neurological patient.
- The various circulatory, inflammatory, metabolic, degenerative, traumatic, autonomic disorders of the nervous system.
- The etio-pathogenesis, the clinical features, management of various adult and child Psychiatric disorders and mental deficiencies.

Course Outcomes

CO1	Evaluate the various neurological dysfunctions clinically and utilize the clinical knowledge in diagnosis and management of disorders of cerebral circulation& head injury.
CO2	Utilize the clinical knowledge in diagnosis and management of inflammatory, demyelinating, degenerative, cerebellar, coordination and extra pyramidal syndromes.
CO3	Demonstrate the cause, pathology, signs-symptoms, differential diagnosis and management of nerve disorders, muscle and neuro-muscular joint disorders.
CO4	Illustrate and demonstrate the cause, pathology, signs-symptoms, differential diagnosis and management of spinal cord disorders, central nervous system tumours, neuro psychological and neurobehavioral disorders
CO5	Illustrate and demonstrate the cause, pathology, signs-symptoms, differential diagnosis and

Multiple sclerosis

- Etiology, pathophysiology, classification, clinical signs & symptoms, investigations, differential diagnosis, medical management, and complications.

Toxic, metabolic and environmental disorders

- Encephalopathy, Alcohol toxicity, Recreational drug abuse, Toxic gases & Asphyxia, Therapeutic & diagnostic agent toxicity, Metal toxicity, Pesticide poisoning, Environmental & physical insults, Pant & Fungal poisoning, Animal poisons, & Complications of organ transplantation.

Cerebellar and coordination disorders

- Congenital ataxia, Friedreich's ataxia, Ataxia telangiectasia, Metabolic ataxia, Hereditary cerebellar ataxia, Tabes dorsalis and Syphilis.

Unit III: disorders of spinal cord and cauda equine**Lower cranial nerve paralysis**

- lesions in trigeminal nerve, trigeminal neuralgia, trigeminal sensory neuropathy, lesions in facial nerve, facial palsy, bell's palsy, hemi facial spasm, Glossopharyngeal neuralgia, lesions of Vagus nerve, lesions of spinal accessory nerve, lesions of hypoglossal nerve. Dysphagia – swallowing mechanisms, causes of dysphagia, symptoms, examination, and management of dysphagia.

Motor neuron diseases

- Amyotrophic lateral sclerosis, Spinal muscular atrophy, Hereditary bulbar palsy, Neuromyotonia and Post-irradiation lumbosacral polyradiculopathy.

Disorders of neuromuscular junction

- Myasthenia gravis, Eaton-Lambert syndrome, and Botulism.

Muscle diseases

- Classification, investigations, imaging methods, Muscle biopsy, management of muscle diseases, genetic counselling. Classification, etiology, signs & symptoms of following disorders – Muscular dystrophy, Myotonic dystrophy, myopathy, Non-dystrophic myotonia.

Polyneuropathy

- Classification of Polyneuropathies, Hereditary motor sensory neuropathy, hereditary sensory and Autonomic neuropathies, Amyloid neuropathy, acute idiopathic Polyneuropathies. Guillain-Barre syndrome – Causes, clinical features, management of GBS, Chronic Idiopathic Polyneuropathies, diagnosis of polyneuropathy, nerve biopsy.

Focal peripheral neuropathy

- Clinical diagnosis of focal neuropathy, neurotmesis, Axonotmesis, Neuropraxia.
- ❖ RSD, Nerve tumors, Brachial plexus palsy, Thoracic outlet syndrome, Lumbosacral plexus lesions,

Phrenic & Intercostal nerve lesions, Median nerve palsy, Ulnar nerve palsy, Radial nerve palsy, Musculocutaneous nerve palsy, Anterior & Posterior interosseous nerve palsy, Axillary nerve palsy, Long thoracic nerve palsy, Suprascapular nerve palsy, Sciatic nerve palsy, Tibial nerve palsy, Common peroneal nerve palsy, Femoral nerve palsy, Obturator nerve palsy, Pudental nerve palsy.

Unit IV: Spinal Cord Disorders**Higher cortical, neuro psychological and neurobehavioral disorders**

- Non-epileptic attacks of childhood, Epilepsy in childhood, Seizures, and Epilepsy syndromes in adult.
- Dyssomnias, Parasomnias, Dementia, Obsessive-compulsive disorders.
- Neural basis of consciousness, causes & investigations of Coma, criteria for diagnosis of Brain death.
- Perceptual disorders and Speech disorders.

Spinal cord disorders

- Spinal cord injury, Compression by IVD prolapse, Spinal epidural abscess, Transverse myelitis, Viral myelitis, Syringomyelia, Spina bifida, Sub acute combined degeneration of the cord, Hereditary spastic paraplegia, Radiation myelopathy, Progressive encephalomyelitis, Conus medullaris syndrome, Bladder & bowel dysfunction, and Sarcoidosis.

❖ **Brain tumors and spinal tumors****Unit V: Paediatric neurology****Paediatric neurology**

- Cerebral palsy, Hydrocephalus, Arnold-chiari malformation, Basilar impression, Klippel-Feil syndrome, Achondroplasia, Cerebral malformations, Autism, Dandy walker syndrome and Down's syndrome.

Neuro surgeries

- Craniotomy, Cranioplasty, Stereotactic surgery, Deep brain stimulation, Burr-hole, Shunting, Laminectomy, Hemilaminectomy, Rhizotomy, Microvascular decompression surgery, Endarterectomy, Embolization, Pituitary surgery, Ablative surgery - Thalamotomy and Pallidotomy, Coiling of aneurysm, Clipping of aneurysm, and Neural implantation.

Unit VI: Latest advances in Neuro diagnostic imaging

1. stereo-electroencephalography
2. diffusion tensor imaging (DTI)
3. Frameless stereotaxy
4. High angular resolution diffusion imaging (HARDI).

Suggested Reading

1. Michael Donaghy. Brain's Diseases of the Nervous System 12th edition, Oxford University Press, 2009, ISBN: 978-0198569381
2. Kenneth W. Lindsay, Ian Bone, Geraint Fuller. Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
3. Patricia A. Downie. Cash's Textbook of Neurology for Physiotherapists, 4th edition, Lippincott, 1986, ISBN: 9780397582983
4. Susan B. O'Sullivan. Physical Rehabilitation 5th edition, Thomas J. Schmitz, F.A. Davis Company, 2006, ISBN: 978-0803612471
5. Anne Shumway-Cook, Marjorie H. Woollacott. Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
6. Darcy A. Umphred. Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060
7. Margaret Johnstone. The Stroke Patient: Principles of Rehabilitation 1st illustrated edition, Churchill Livingstone, 1976, ISBN: 9780443014871
8. Michael Donaghy. Brain's Diseases of the Nervous System 12th edition, Oxford University Press, 2009, ISBN: 978-0198569381
9. Susan S. Adler, Dominiek Beckers, Math Buck. PNF in Practice: An Illustrated Guide 3rd edition, Springer, 2007, ISBN: 978-3540739012
10. Sophie Levitt. Treatment of Cerebral Palsy and Motor Delay 5th edition, Wiley-Blackwell, 2010, ISBN: 978-1405176163
11. Janet H. Carr, Roberta B. Shepherd. Neurological Rehabilitation: Optimizing Motor Performance 2nd edition Churchill Livingstone, 2010, ISBN: 978-0702040511
12. Prof. Walter R. Frontera. DeLisa's Physical Medicine and Rehabilitation: Principles and Practice, Two Volume Set, 5th edition, Lippincott Williams & Wilkins, 2010, ISBN: 978-0781798198
13. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston. Davidson's Principles & Practice of medicine 21st edition, Churchill Livingstone, 2010, ISBN: 978-0702030857.

	L	T	P	C
	1	0	0	1

Course Objectives:

1. To study the concept of what it means to be a professional and how physiotherapy profession is different from a usual vocation.
2. To explain how relevant is professionalism in terms of healthcare system and how it affects the overall patient environment.

Course Outcomes

CO1	To Understand the importance of the ethics and moral values
CO2	To give importance attitude and professional behaviour treating people equally.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

Unit I: The Physiotherapist as Patient/Client manager.

1. Evaluation and diagnosis
2. Diagnosis as clinical decision making.
3. Prognosis.
4. Discharge planning and discontinuance of care
5. Discontinuance of care
6. Outcome
7. Clinical decision making
8. Referral relationships
9. Interpersonal relationships
10. Ethical and legal issues
11. Informed consent
12. Managed care and fidelity.

8 Hours

Unit II The Physiotherapist as Administrator

Name of The Course	Professionalism and values
Course Code	BPHY6004
Prerequisite	
Co-requisite	
Anti-requisite	

1. History of physiotherapy administration
2. Contemporary physiotherapy administration
3. Patient/client management
4. First-line management
5. Midlevel managers and chief executive officers
6. Leadership
7. Ethical and legal issues.

7 Hours

Suggested Reading

Physical Therapy Ethics , 2nd Edition Donald L. Gabad PT, P.hD, Mike W. Martin P.hD , published by F DAVIS COMPANY ,Philadelphia.

Human Values and Professional Ethics, Values of Ethics & Profession by Jayshree Suresh, BS Raghavan

Published by S. Chand.

Name of The Course	PT in Ortho and Sports LAB			
Course Code	BPHY 6005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	5	2.5

Course Objectives

To study

- 1. Basic principles of assessment and application of physical therapy in treatment of various musculoskeletal condition.**
- 2. Application of principles of physiotherapy assessment and management in sports condition**

Course Outcomes

CO1	To be able to identify disabilities due to various musculoskeletal dysfunction
CO2	To plan and set treatment goals
CO3	To apply the skills gained in exercise therapy in clinical situation
CO4	To apply the skills gained in electro therapy in clinical situations
CO5	To apply the skills of physiotherapy in different sports condition

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content :

- 1.To perform physiotherapy assessment of an orthopaedic patient
- 2.To perform Special tests for upper limb
- 3.To perform special tests for lower limb
- 4.To perform neuro-dynamic testing.
- 5.To study McKinzie assessment
- 6.To study physiotherapy assessment of an amputee patient.
- 7.To study basic principles of application of physical therapy in treatment of degenerative conditions
- 8.To study basic principles of application of physical therapy in treatment of rheumatoid conditions
- 9.To study basic principles of application of physical therapy in treatment of spinal conditions
- 10.To study basic principles of application of physical therapy in treatment of amputation

Suggested Reading

- Brent Brotzman. Clinical Orthopaedic Rehabilitation: An Evidence-Based Approach 3rd edition, Robert C. Manske, Mosby Publishers, 2011, ISBN: 978-0323055901
- Susan B. O'Sullivan. Physical Rehabilitation 5th Edition, Thomas B. Schmitz, F a Davis Company, 2007, ISBN: 9780803612471
- David J. Magee. Orthopedic Physical Assessment 5th edition, Elsevier Health Sciences, 2008, ISBN: 978-0721605715
- Geoff Maitland Elly Hengeveld, Kevin Banks, Kay English. Maitland's Vertebral Manipulation 7th edition, Butterworth-Heinemann, 2005, ISBN: 9780750688062
- John Ebnezer. Essentials of Orthopaedics for Physiotherapists 1st edition, Jaypee Brothers Medical Publisher (P) Ltd, 2003, ISBN: 9788180611148

Name of The Course	BPHY6006			
Course Code	Physiotherapy in General Medicine and General surgery (Lab)			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	5	2.5

Course Objectives

The student is expected to study:

1. Basic principles of assessment and application of physical therapy in treatment of various medical and surgical conditions.
2. General principles of physiotherapy assessment and management in surgery and medicine.

Course Outcomes

CO1	Understand the importance of pre and post op physiotherapy in rehabilitation
CO2	Utilize the knowledge of surface anatomical landmarks and related clinical skills
CO3	Apply the knowledge of positioning ,splinting, and muscle re-education etc.in burn and reconstructive surgeries
CO4	Utilize the knowledge of anatomy and physiology to understand the female reparative organs, the surgeries related to it, the reproductive health, and the surgical approaches.
CO5	Demonstrate application of various general rehabilitation process in various medical condition

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practicals:
Practical 1: Practical demonstration of checking Vital stats (BP, PULSE, TEMP, HR)ETC.
Practical 2: Demonstration of basic principles of application of physical therapy in treatment of Various General Surgical procedure.(preop & post op)

Practical 3: Practical demonstration of basic principles of application of physical therapy in treatment of Burns and Plastic Surgery
Practical 4: Practical demonstration of Prenatal & Post natal Exercises Program.(C-section cases etc).
Practical 5: Practical demonstration of basic principles of application of physical therapy in Gynaecological surgeries(Hysterectomy, etc).
Practical 6: Practical demonstration of application of physiotherapy post gynaecological conditions(incontinence, prolapsed uterus etc).
Practical 7: Practical demonstration of assessment of a bed ridden patient post surgery.
Practical 8: Practical demonstration of handling geriatrics patients(assessment proforma)
Practical 9: Practical demonstration of physiotherapy management of Fascial palsy patient.
Practical 10: Practical Demonstration of General exercises for weight gain and weight loss. (Fitness education.)

Course Code	Clinical neurology & neurosurgery (lab)			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

The student is expected to study:

1. Evaluation and examination of a patient with neurological pathology
2. General outline of electro diagnostic procedures.
3. Interpretations and prognosis in different neurological conditions.
4. Principles of Physiotherapy at various stages of Rehabilitation, establishing the goals of rehabilitation and ADL training

Course Outcomes

CO1	To interpret the differential diagnosis of various neurological conditions.
CO2	To evaluate the various neurological dysfunctions clinically.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practicals:
Practical 1: Clinical examination of a neurological patient: consciousness, memory, attention, cognitive functions, motor examination, sensory examination
Practical 2: Clinical examination of a neurological patient: consciousness, memory, attention, cognitive functions, motor examination, sensory examination
Practical 3: demonstrate Cranial nerve examination
Practical 4: Demonstrate Use of scales in various neurological conditions: Glasgow Coma Scale, ASIA impairment scale, Ranchos Los Amigos Scale

Suggested Reading

1. Tidy's physiotherapy. Porter, Stuart B., and Noël M. Tidy. 2013. Edinburgh: Elsevier.
2. Physiotherapy in Medical Conditions :Suraj Kumar
3. Physiotherapy in surgical conditions: Pushpalmitra
4. Cash's textbook of general medical and surgical conditions for physiotherapists Joan E Cash; Patricia A Downie Philadelphia : Lippincott, ©1984.
5. Margaret Polden, Jill Mantle. Physiotherapy in Obstetrics & Gynecology 1st edition, Butterworth-Heinemann, 1990, ISBN: 978-0750600163

Name of The Course	BPHY6007
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Practical 5: Demonstrate Physiotherapy Assessment and management protocol of Spinal cord injury
Practical 6: Demonstrate static and dynamic Balance tests
Practical 7: Demonstrate equilibrium and non equilibrium Coordination tests
Practical 8: Demonstrate on observational and analytical Gait assessment
Practical 9: Demonstrate the prevention of secondary complications of bed ridden patient after neurosurgery.
Practical 10: Demonstration of reeducation and recreational training techniques after neurosurgery.

Name of The Course	CLINICAL EDUCATION			
Course Code	BPHY6008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	13	7.5

Course Objectives

- Approach to patient, collection of demographic data, art of history taking and bedside / OPD manners in relation to patient, general assessment of patient from therapeutic point of view, reaching to provisional diagnosis, and testing of therapeutic skill learned.
- The student will be posted in the department of Physiotherapy & he/she will learn the assessment, diagnosis, & physiotherapy treatment of patients visiting the department.

Course Outcomes

CO1	To demonstrate an understanding of patient's problem and chief complaint.
CO2	To demonstrate the clinical special tests for various musculoskeletal and neurological conditions.
CO3	To employ the best treatment method on patients to achieve a favourable outcome.
CO4	To demonstrate teamwork, leadership, better understanding of the situation and professional qualities in OPD and IPD setups.

Suggested Reading

- Michael Donaghy. Brain's Diseases of the Nervous system 12th edition, Oxford University Press, 2009, ISBN: 978-0198569381.
- Kenneth W. Lindsay, Ian Bone, Geraint Fuller. Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574.
- Patricia A. Downie. Cash's Textbook of Neurology for Physiotherapists, 4th edition, Lippincott, 1986, ISBN: 9780397582983.
- Susan B.O'Sullivan,. Physical Rehabilitation 5th edition, Thomas J. Schmitz, F.A. Davis Company, 2006, ISBN: 978-0803612471.
- Anne Shumway-Cook, Marjorie H. Woollacott. Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439.
- Darcy A. Umphred. Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060 Patricia A. Downie. Cash's Textbook of Neurology for Physiotherapists, 4th edition, Lippincott, 1986, ISBN: 9780397582983.
- Susan B.O'Sullivan,. Physical Rehabilitation 5th edition, Thomas J. Schmitz, F.A. Davis Company, 2006, ISBN: 978-0803612471.
- Anne Shumway-Cook, Marjorie H. Woollacott. Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 978068330643

CO5	To demonstrate work ethics and maintain records of the patients for future use and follow-up.
Co6	To Practice the techniques of physiotherapy

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Contents:

<p>Unit-1 Clinical Assessment and examination of Upper limb</p>
<p>Clinical Assessment and examination of shoulder complex, Clinical Assessment and examination of elbow, Clinical Assessment and examination of wrist joint, Clinical Assessment and examination of hand complex, Common anomalies of upper limb</p>
<p>Unit-2 Clinical Assessment and examination of Lower limb</p> <p>Clinical Assessment and examination of hip joint, Clinical Assessment and examination of knee joint, Clinical Assessment and examination of foot & ankle complex, Common anomalies of lower limb</p>
<p>Unit-3 Clinical Assessment and examination of Spine</p>

Clinical Assessment and examination of upper cervical spine, Clinical Assessment and examination of lower cervical spine, Clinical Assessment and examination of lumbar spine, Clinical Assessment and examination of sacroiliac joint, Posture assessment, Common anomalies of spine

Unit-4 Neurological Examination

Assessment of higher mental functions, history taking, sensory assessment, motor assessment, balance and coordination assessment, Quality of life assessment

Unit-5

Case study

Unit 6

8 hours

Hands on practice

- **Mobilization**
- **Biofeedback**
- **Kinesiology taping**
- **Mulligan technique**
- **Maitland techniques**

- **workshop to be attended on**

- Bob bath technique
- PNF
- Recent advances in the field of physiotherapy

- **Topic presentation**
- Case presentation
- Presentation on new researches in the field of physiotherapy

Suggested reading

Text Book (s):

Orthopaedic physical Assessment by David

Magee, 6th edition, Elsevier India(2014)

Reference Book (s)

Textbook of Orthopaedics by John

Ebnezar, Jaypee Brothers Medical Publishers

	4	0	0	4

Course Objectives

The student is expected to study:

- 1.The clinical examination of a neurological patient.
- 2.The neurology and neurosurgery with skills to apply these in clinical situations of dysfunction and neurological pathology.
3. The etio-pathogenesis, the clinical features, management of various adult and child Psychiatric disorders and mental deficiencies

Course Outcomes

CO1	To evaluate the variousNeurological Assessment & Neuro physiological Technique
CO2	To evaluate &utilize the clinical knowledge in diagnosis and managementof Brain & Spinal Cord Disorders , Cerebellar and Muscle Disorders
CO3	To Illustrate Paediatric Neurologyand demonstrate the ,Evaluation and Management of Peripheral Nerve Injuries and Disorders
CO4	To relate and assess variousNeurological gaits & Applied Yoga in Neurological conditions.
CO5	To utilize the clinical knowledge in Preandpost-surgical assessmentand treatment of neurological conditions
CO6	Appraise the recent evaluation methods and rehabilitation techniques for neurological disorders

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Course Content:

Name of The Course	Physiotherapy in Neurology & psychosomatic disorder			
Course Code	BPHY7001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C

**Unit-1 -Introduction toNeurological Assessment
& Neuro physiological Technique
(12 hours)**

1. Examination, Chief complaints, History taking – Present, Past, medical, familial, personal histories, Observation, Palpation, Higher mental function – Consciousness, Orientation, Wakefulness, memory, Speech, Reading, Language, Writing, Calculations, Perception, Left right confusion, Reasoning, and Judgment, Motor Examination – Muscle power, Muscle tone, Spasticity, Flaccidity, Reflexes – Developmental reflexes, deep tendon reflexes, Superficial reflexes, Sensory examination – Superficial, Deep and Cortical sensations, Special tests – Romberg’s, Kernig’s sign, Brudzki sign, Tinel’s sign, Slum test, Lehermitte’s sign, Bells Phenomenon, Gower’s sign, Sun set sign, Battle’s sign, Glabellar tap sign, etc, Balance examination, coordination examination, Gait analysis – Kinetics & Kinematics (Quantitative & Qualitative analysis), Functional Analysis, Assessment tools & Scales – Modified Ashworth scale, Berg balance scale, FIM, Barthel index, Glasgow coma scale, Mini mental state examination, Rancho Los Amigos Scale for Head injury, APGAR score, ASIA scale, Reflex Grading. Differential diagnosis.
2. Neuro physiological Techniques :- Concepts, Principles, Techniques, Effects of following Neurophysiological techniques: NDT, PNF, Vojta therapy, Rood’s Sensory motor Approach, Sensory Integration Approach, Brunnstorm movement therapy, Motor relearning program, Contemporary task oriented approach, Muscle re-education approach and Constraint induced movement therapy.

**Unit-2 Evaluation and Management of Brain
& Spinal Cord Disorders , Cerebellar and
Muscle Disorders (12 hours)**

1. **History, Observation, Palpation, Higher mental function, Cranial nerve examination, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance &**

Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches& Modalities in Cerebro vascular Accident, Meningitis, Encephalitis, Head Injury, Brain Tumors, Perceptual disorders, Amyotrophic lateral sclerosis, and Multiple sclerosis.

2. **Cerebellar, Spinal Cord and Muscle Disorders : History, Observation, Palpation, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches& Modalities in Ataxia, Sensory Ataxia, Parkinson’s disease, Muscular dystrophy (DMD), Myasthenia Gravis, Eaton-Lambert Syndrome, Spinal tumors, Spinal cord injury, Transverse myelitis, Bladder & Bowel Dysfunction, Spinal muscular atrophies, Poliomyelitis, Post-Polio Syndrome.**

**Unit-3 Paediatric Neurology ,Evaluation and
Management of Peripheral Nerve Injuries and
Disorders**

(12hours)

1. Paediatric Examination, Developmental milestones, developmental reflexes, Neuro developmental screening tests. Evaluation & Management - History, Observation, Palpation, Milestone Examination, developmental reflex Examination, Higher mental function, Cranial nerve examination, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination

examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches & Modalities in Risk babies, Minimum brain damage, Developmental disorders, Cerebral palsy, Autism, Down's Syndrome, Hydrocephalus, Chorea, Spina bifida, and syringomyelia.

2. **History, Observation, Palpation, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches & Modalities in Hereditary motor sensory neuropathy, Guillain-Barre syndrome, Brachial plexus palsy, Thoracic outlet syndrome, Lumbosacral plexus lesions, Phrenic & intercostals nerve lesions, Median nerve palsy, Ulnar nerve palsy, Radial nerve palsy, Musculocutaneous nerve palsy, Anterior & Posterior interosseous nerve palsy, Axillary nerve palsy, Long thoracic nerve palsy, Suprascapular nerve palsy, sciatic nerve palsy, Tibial nerve palsy, Common peroneal nerve palsy, Femoral nerve palsy, Obturator nerve palsy, and Pudental nerve palsy.**

Unit-4 Assessment and management of Neurological gaits , Applied Yoga in Neurological conditions. (12 hours)

1. Quantitative and Qualitative (Kinetic & Kinematics) analysis, List of Problems, short & Long Term goals, Management of following Neurological Gaits - Hemiplegic gait, Parkinson gait, High step gait, Hyperkinetic gait, Hypokinetic gait, Waddling gait, Scissoring

gait, Spastic gait, Chorea form Gait, Diplegic Gait, and Myopathic Gait.

2. Applied Yoga in Neurological conditions

Unit-5- Pre and post-surgical assessment and treatment of following conditions :- (12 hours)

1. spinal disc herniation,
2. Spinal stenosis, Spinal cord trauma, Head trauma, Brain tumors, Tumors of the spine,
3. Spinal cord and peripheral nerves, Cerebral aneurysms, Subarachnoid hemorrhages, epilepsy,
4. Parkinson's disease, Chorea, Hemiballism, Psychiatric disorders, Malformations of the nervous system, Carotid artery stenosis , Arteriovenous malformations, and Spina bifida

Unit 6 - Recent advances in Neurological physiotherapy (8hours)

5. Assessment: Retraining and posturgraphy , biofeedback
6. Advanced neurorehabilitation techniques: Robotic-assisted training, body weight supported treadmill training, virtual reality, body awareness therapy, Non-invasive brain stimulation, functional electrostimulation, hippotherapy, coma stimulation therapy
7. Evidence based practice: Case studies

Suggested Reading

- MichaelDonaghy. Brain`s Diseasesof the Nervoussystem 12th edition, , Oxford University Press, 2009, ISBN: 978-0198569381
- Kenneth W. Lindsay, Ian Bone, Geraint Fuller. Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574

- Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston. Davidson's Principles & Practice of Medicine 21st edition, Churchill Livingstone, 2010, ISBN: 978-0702030857
- Niraj Ahuja. A Short Textbook of Psychiatry, 6th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2006, ISBN: 9788180618710
- Michael Gelder, Paul Harrison, Philip Cowen. Shorter Oxford Text Book of Psychiatry 6th edition, OUP Oxford Publishers, 2006, ISBN: 978-0198566670

Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives:

The student is expected to study the basic principles and application of

- Enumerate the steps of research process
- Explain the different research methods
- Describe the importance and use bio-statistics for research work
- Develop skills of critical thinking and selection of research strategy
- Acquire skills to review literature, formulate problems, research writing and publishing.

Course Outcomes

CO1	To assess the appropriateness of different kinds of research designs and methodology for instance in terms of their appropriateness, transparency and quality.
CO2	Propose a research study and justify the theory as well as the methodological decisions, including sampling and measurement
CO3	Choose appropriate quantitative or qualitative method to collect data.
CO4	To apply advanced knowledge in statistics to experimental and applied research.
CO5	To assess and critique a published journal article that uses one of the primary research methods in the field.

Name of The Course	RESEARCH METHODOLOGY AND BIostatISTICS
Course Code	BPHY7002

Co6	Understanding the basics of data analysis ,research writing &plagarism
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Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Contents:

Unit-1

11 hours

Research in Physiotherapy

- ❖ Introduction to Research methodology: Meaning of research, objectives of research, Motivation in research
- ❖ Types of research & research approaches
- ❖ Research methods vs methodology
- ❖ Criteria for good research, Problems encountered by researchers in India.

Concepts of Measurements and Scaling technique

- ❖ Measurement scales, sources of error in measurement, Technique of developing measurement tools

Meaning of scaling, its classification. Important scaling techniques.

Unit-2

11 hours

Research Problem and Research Design

- ❖ Statement of research problem., Statement of purpose and objectives of

research problem, Necessity of defining the problem

: Meaning of research design, Need for research design, Features for good design, Different research designs, Basic principles of research design

Sampling fundamentals and Sampling Design

- ❖ Sampling fundamentals: need for sampling & some fundamental definitions, important sampling distributions.
- ❖ Sampling Design: Criteria for selecting a sampling procedure, Implications for sampling design, steps in sampling design,

Characteristics of good sample design,

Different types of sample design

Unit-3

12 hours

Hypothesis Testing

- ❖ What is hypothesis? Basic concepts concerning testing of hypothesis
- ❖ Procedure of hypothesis testing, measuring the power of hypothesis test
- ❖ Tests of hypothesis, limitations of the tests of hypothesis

Data Collection Methods

- ❖ Collection of primary data, collection of data through questionnaires & schedules, Difference between questionnaires & schedules.

Data Analysis and Processing

Processing operations, problems in processing, Types of analysis

Unit-4

12 hours

Introduction to Biostatistics

- Meaning, definition, characteristics of statistics., Importance of the study of statistics
- Branches of statistics, Statistics and health science including physiotherapy

- Parameters and Estimates, Descriptive and inferential statistics, Variables and their types, Measurement scales.

Tabulation of Data

- Basic principles of graphical representation
- Types of diagrams – histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, Normal probability curve.

Measures of Central Tendency

- Need for measures of central Tendency
- Definition and calculation of mean – ungrouped and grouped, Meaning, interpretation and calculation of median ungrouped and grouped
- ❖ Meaning and calculation of mode
- ❖ Comparison of the mean, median and mode, Guidelines for the use of various measures of central tendency

Unit-5 10 hours

Probability and Standard Deviation

- Meaning of probability of standard distribution
- The binomial distribution, the normal distribution, Divergence from normality – skewness, kurtosis.

Analysis of variance and covariance

- Analysis of variance (ANOVA), what is ANOVA?
- Basic principle of ANOVA, ANOVA technique
- Analysis of Covariance (ANCOVA).

Format of scientific documents. (Structure of protocols, formats reporting in scientific journals, systematic reviews and meta-analysis).

Unit 6 8 hours

- Introduction to statistical analysis its basics concepts & its application.
- Introduction to qualitative research writing
- Introduction to plagiarism

Suggested Reading

Text Book (s)

- **Carolyn M. Hicks. Practical Research Methods for Physiotherapists, Churchill Livingstone, 1988, ISBN: 978-0443037573**

Reference Book (s)

- Mitchell Batavia. Clinical Research for Health Professionals: A User-Friendly Guide 1st edition, Butterworth-Heinemann, 2000, ISBN: 978-0750671934
- B.K. Mahajan. Methods in Biostatistics 6th edition, Jaypee Brothers Publishers, 2002, ISBN: 9788171795208

Course Objectives**The student is expected to study:**

1. Students will understand the importance of wellness and fitness principles as they relate to better health.
2. Students will be exposed to a variety of activities providing them the opportunity to apply and utilize knowledge in risk reduction.

Course Outcomes

CO1	Conduct assessments of fitness, well-being for clients and effectively communicate assessment results.
CO2	Prescribe appropriate physical activity and fitness programs to enhance health, fitness, and well-being of society.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction	7 Hours
Prevention practice: a holistic perspective for physiotherapy Defining Health, Predictions of Health Care, Comparing Holistic Medicine and Conventional Medicine, Distinguishing Three Types of Prevention Practice. Healthy People Definition of healthy people, Health education Resources, Physiotherapist role for a healthy community.	
Unit-2 Key concepts of fitness	8 hours
Defining & Measuring Fitness, Assessment of Stress with a Survey, Visualizing Fitness, Screening for Mental and Physical Fitness, Body Mass Index calculations. Fitness training Physical Activities Readiness Questionnaire, Physical Activities Pyramid. Exercise Programs Evidence-Based Practice.	

Name of The Course	Health Promotion and Fitness			
Course Code	BPHY7003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Suggested Reading

1. Manoj Sharma, Theoretical foundation of health education and health promotion, Third Edition
 2. Tom R. Thomas, Fitness and Health Promotion, Reference Book (s)
- Nllie M. Cyr, Health Promotion Disease prevention and Exercise Epidemiology

Name of The Course	CLINICAL CARDIOVASCULAR AND PULMONARY			
Course Code	BPHY7004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

- 1.To study various cardiac and pulmonary disorders and their common investigations.
- 2.To study clinical reasoning and documentation for cardiac and pulmonary disorders and patients for general surgery.

Course Outcomes

CO1	To understand the basic knowledge of anatomy, physiology, common diseases/ conditions involving cardiovascular and pulmonary systems.
CO2	To illustrate various cardiopulmonary investigatory techniques.
CO3	To describe and implement management for various cardiac diseases.
CO4	To describe and implement treatment protocol for various disorders of heart.
CO5	To describe and implement management for various pulmonary diseases.
CO6	To demonstrate the recent approaches in clinical cardiovascular and pulmonary system

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Course Content:

<p>Unit-1: Anatomy and Physiology</p> <p>a) Respiratory system</p> <ol style="list-style-type: none"> Upper respiratory tract, Lower respiratory tract, Respiratory unit, Muscles of respiration, Pleura, intra pleural space, intra pleural pressure, surfactant. Mechanics of respiration – Chest wall movements, lung & chest wall compliance, V/Q relationship, airway resistance. Neural & chemical regulation of respiration Lung volumes and lung capacities, Spiro meter, lung function test Pulmonary circulation, Lung sounds. <p>b) Cardiovascular system</p> <ol style="list-style-type: none"> Chambers of heart, semi lunar and atria ventricular valves Coronary circulation, conductive system of heart Cardiac cycle, ECG, Heart sounds Blood pressure, pulse, cardiac output
<p>Unit-2 :Examination& Investigation</p> <p>a) Respiratory Disease : Chest X Rays, Pulmonary Function Testing, Arterial Blood Gas</p>

b) Cardiovascular System : ECG, Exercise Stress Testing, Radiology, Angiography

Unit-3 : Cardiovascular diseases

- Aetiology, pathogenesis, clinical features, complications, management of the following:-
 - Ischemia heart disease, Myocardial infarction, Heart failure, Cardiac arrest, Rheumatic fever, Hypertension, Infective endocarditis, Myocarditis & cardiomyopathy

Unit-4 : Disorders of the Heart

- Definition, Clinical features, diagnosis and choice of management for the following disorders :
 - Congenital Heart diseases – Acyanotic & Cyanotic congenital heart disease : Patent Ductus Arteriosus, Coarctation of Aorta, Atrial Septal Defect, Ventricular Septal Defect, Tetralogy of Fallot, Transposition of Great Vessels ; Acquired Heart Disease – Mitral Stenosis & Insufficiency, Aortic Stenosis and Insufficiency, Ischemic Heart Disease – Coronary Artery Disease, Cardiac tumors.

Unit-5: Respiratory diseases & Disorders

- Clinical manifestations of Lung disease ; COPD and RLD
 - Definition, Etiology, Clinical features, signs and symptoms, complications, management and treatment of following lung diseases :
 - Chronic Bronchitis, Emphysema, Asthma, Bronchiectasis, Cystic Fibrosis, Upper Respiratory Tract Infections, Pneumonia, Tuberculosis, Fungal Diseases, Interstitial Lung Diseases, Diseases of the pleura, diaphragm and chest wall ; Respiratory failure – Definition, types, causes, clinical features, diagnosis and management.
- Chest wall disorders- Clinical features, diagnosis and choice of management for the following

disorders – chest wall deformities, chest wall tumors, Spontaneous Pneumothorax, Pleural Effusion, Empyema Thoracis, Lung abscess, Bronchiectasis, Tuberculosis,

Unit-6: Recent Advances in Clinical Cardiovascular and Pulmonary

Recent advancements in radiology imaging related to cardiopulmonary diseases.

Suggested Reading

1. Donna L. Frownfelter. Chest physical therapy & pulmonary rehabilitation: an interdisciplinary approach, Yearbook Medical Publishers, 1978, ISBN: 9780815132967
2. Jennifer A. Pryor, Ammani S. Prasad. Physiotherapy for Respiratory and Cardiac Problems 4th revised edition, Churchill Livingstone, 2008, ISBN: 9780080449852
3. Joan E. Cash, Patricia Downie. Cash`s text book of General Medical & Surgical conditions for Physiotherapists, 2nd edition revised, Mosby, ISBN: 978-0571140640
4. Egan's Fundamentals of Respiratory Care 11ed

Name of The Course	Principles of Management			
Course Code	BPHY 7005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. The students are expected to study about leadership skills, management strategies and effective planning.

Course Outcomes

CO1	To apply the principles of management to evaluate organizational scenarios.
CO2	To understand the importance of Planning and making strategies in hospital.

CO3	To understand the organisational changes, managing the conflicts and making correct decisions within the organization.
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Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Course Content:

<p>Unit I: Principles of Management 6 Hours</p> <ul style="list-style-type: none"> • Definition of Management, Characteristics of Management • Management Functions/ the Process of Management, Nature of Management • Management Vs. Administration • Levels of Management, Managerial Skills • The Manager and his job • Principles of Management & Significance of Management.
<p>Unit II: Strategic Management and Planning 6Hours</p> <ul style="list-style-type: none"> • Strategic management- basics, objectives, levels of strategy, SWOT analysis, strategy implementation. The Roles of Mission, Vision, and Values. • The Concept of Planning, Nature and Scope of Planning • Importance of Planning, Advantages and Limits of Planning, Measures to Overcome Limitations of Planning • Basic Principles of Planning, Categories and Levels of Planning • Essential Steps in Planning, Planning tools & techniques
<p>Unit III: Time Management & Cost Efficiency 6Hours</p> <ul style="list-style-type: none"> • Introduction to time management, principles of time management, importance of time management, setting priorities • Goals of time management, Task list, relation between stress & time management. • Comparing types on time management, role of latest technology for time management. • Definition of cost, types of cost, definition of cost effectiveness • definition of cost efficiency, principles of efficiency, measuring cost effectiveness and efficiency.

Suggested Reading

1. Textbook of management- Philip Kotler
2. Textbook on management, by R.Pettinger (14th edition)

	0	0	5	2.5
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Course ObjectivesThe student is expected to study:

1.The clinical examination of a neurological patient.

2. The neurology and neurosurgery with skills to apply these in clinical situations of dysfunction and neurological pathology.

3.The etio-pathogenesis, the clinical features, management of various adult and child Psychiatric disorders and mental deficiencies.

Course Outcomes

CO1	Study the assessment of a neurological patient and motor examination
CO2	Study the sensory examination to study the mental status examination of a patient
CO3	Study the cranial nerve examination and coordination and balance assessment.
CO4	Functional analysis and assessment tools & scales neuro physiological techniques
CO5	Study the superficial and deep reflexes and primitive and tonic reflexes and developmental milestones.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practicals
1. TO STUDY THE ASSESSMENT OF A NEUROLOGICAL PATIENT- EXAMINATION, CHIEF COMPLAINTS, HISTORY TAKING –PRESENT, PAST,

Name of The Course	Physiotherapy in Neurology & psychosomatic disorder (LAB)
Course Code	BPHY7006
Prerequisite	
Co-requisite	
Anti-requisite	
	L T P C

MEDICAL, FAMILIAL, PERSONAL HISTORIES, OBSERVATION, PALPATION.

2. **MOTOR EXAMINATION** – MUSCLE POWER, MUSCLE TONE, SPASTICITY, FLACCIDITY, REFLEXES – DEVELOPMENTAL REFLEXES, DEEP TENDON REFLEXES, SUPERFICIAL REFLEXES.
3. **TO STUDY THE SENSORY EXAMINATION**– SUPERFICIAL, DEEP AND CORTICAL SENSATIONS, SPECIAL TESTS – ROMBERG’S, KERNIG’S SIGN, BRUDENZKI SIGN, TINEL’S SIGN, SLUM TEST, LEHERMITTE’S SIGN, BELLS PHENOMENON, GOWER’S SIGN, SUN SET SIGN, BATTLE’S SIGN, GLABELLAR TAP SIGN.
4. **TO STUDY THE MENTAL STATUS EXAMINATION OF A PATIENT**- CONSCIOUSNESS, ORIENTATION, WAKEFULNESS, MEMORY, SPEECH, READING, LANGUAGE, WRITING, CALCULATIONS, PERCEPTION, LEFT RIGHT CONFUSION, REASONING, AND JUDGMENT.
5. **TO STUDY THE CRANIAL NERVE EXAMINATION.**
6. **TO STUDY THE COORDINATION AND BALANCE ASSESSMENT.**
7. **FUNCTIONAL ANALYSIS, ASSESSMENT TOOLS & SCALES** – MODIFIED ASHWORTH SCALE, BERG BALANCE SCALE, FIM, BARTHEL INDEX, GLASGOW COMA SCALE, MINI MENTAL STATE EXAMINATION, RANCHO LOS AMIGOS SCALE FOR HEAD INJURY, APGAR SCORE, ASIA SCALE, REFLEX GRADING. DIFFERENTIAL DIAGNOSIS.
8. **NEURO PHYSIOLOGICAL TECHNIQUES** :- CONCEPTS, PRINCIPLES, TECHNIQUES, EFFECTS OF FOLLOWING NEUROPHYSIOLOGICAL

TECHNIQUES: NDT, PNF, VOJTA THERAPY, ROOD’S SENSORY MOTOR APPROACH, SENSORY INTEGRATION APPROACH, BRUNNSTORM MOVEMENT THERAPY, MOTOR RELEARNING PROGRAM, CONTEMPORARY TASK ORIENTED APPROACH, MUSCLE RE-EDUCATION APPROACH AND CONSTRAINT INDUCED MOVEMENT THERAPY.

9. TO STUDY THE SUPERFICIAL AND DEEP REFLEXES AND PRIMITIVE AND TONIC REFLEXES.
10. TO STUDY ABOUT THE DEVELOPMENTAL MILESTONES.

Suggested Reading

- Susan B.O’Sullivan,. Physical Rehabilitation 5th edition, Thomas J. Schmitz, F.A. Davis Company, 2006, ISBN: 978-0803612471
- Anne Shumway-Cook, Marjorie H. Woollacott. Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
- Darcy A. Umphred. Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060
- Kenneth W. Lindsay, Ian Bone, Geraint Fuller. Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
- Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston. Davidson’s Principles & Practice of medicine 21st edition, Churchill Livingstone, 2010, ISBN: 978-0702030857
- Niraj Ahuja. A Short Textbook of Psychiatry, 6th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2006, ISBN: 9788180618710
- Michael Gelder, Paul Harrison, Philip Cowen.

Shorter Oxford Text Book of Psychiatry 6th edition, OUP Oxford Publishers, 2006, ISBN: 978-0198566670

Course Outcomes

On course completion the student will be able to

CO1	Conduct assessments of fitness, well-being for clients and effectively communicate assessment results.
CO2	Prescribe appropriate physical activity and fitness programs to enhance health, fitness, and well-being of society.
CO3	Develop and implement risk management strategies for health and fitness programs, activities, and facilities during childhood and adolescence.
CO4	Implement strategies and plans for enhancement of health and prevention from diseases
CO5	Prevention from developmental disabilities, and awareness of health and wellness programs

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practical 1: Health Fitness and wellness- introduction
Practical 2: Health fitness training methods
Practical 3: Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions
Practical 4: Case presentations and case discussions on childhood and adolescence
Practical 5: Case presentations and case discussions on adulthood and older adults
Practical 6: Prevention practice for musculoskeletal conditions
Practical 7: Prevention practice for cardiopulmonary conditions
Practical 8: Prevention practice for neuromuscular conditions

Name of The Course	Health Promotion and Fitness-Lab			
Course Code	BPT7007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

The student is expected to study:

- Students will understand the importance of wellness and fitness principles as they relate to better health.
- Students will be exposed to a variety of activities providing them the opportunity to apply and utilize knowledge in risk reduction.

Practical 9:Prevention practice for integumentary disorders
Practical 10: Prevention practice for individuals with developmental disabilities

Suggested Reading

1. Lab Manual
2. ManojSharma, Theoretical foundation of health education and health promotion, Third Edition
3. Tom R. Thomas, Fitness and Health Promotion,
4. Reference Book (s)
5. Nllie M. Cyr, Health Promotion Disease prevention and Exercise Epidemiology

4. To ensure the attention of a student and make the more receptive such as group activities, interactive for a role-plays and clinical bed-side demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers.
CO2	Understanding the bedside assessment of a patient or to the course of the disease
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation.
CO5	Understanding basic knowledge of exercise therapy and its implementation
Co6	Understanding the recent advance clinical techniques in the field of physiotherapy

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Name of The Course	Clinical education			
Course Code	BPHY7008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	13	7.5

Course Contents:

Unit-1
The community orientation and clinical visit will include visit to the entire chain of health care delivery system -Sub centre, PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.
Unit-2
The student will also be briefed regarding information about a patient's clinical status including signs, symptoms, and course of a

Course Objectives

3. To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the under-graduate program and across their career.

disease
Unit-3
Clinical visit to their respective professional department within the hospital.
Unit-4
The students will learn about the construction and principle of working of various electrotherapeutic modalities and will be explained the indications, contraindications and harmful effects of the same. They will be taught to perform a check for all modalities. This will enable the students to apply these modalities for therapeutic purpose efficiently.
Unit-5
Develop the skills of the students in areas like assessment of physical parameters (joint range of motion, muscle strength etc) and principles of exercise therapy (strengthening, stretching, goniometry etc) and its application.
Unit 6: Latest Trends
8 hours
<ul style="list-style-type: none"> • Hands on practice • Mobilization • Biofeedback • Kinesiology taping • Maitland techniques <ul style="list-style-type: none"> • workshop to be attended on • clinical physiotherapy techniques • Physiotherapy recent advance trends <ul style="list-style-type: none"> • Topic presentation • Case presentation • Presentation on new researches in the field of physiotherapy

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Suggested reading

Text Book (s):

- Textbook of rehabilitation by S. Sanders
- **Tidy's Physiotherapy, 12th edition, Ann M. Thomson, Alison T. Skinner, Joan Piercy, Butterworth-Heinemann, 1991, ISBN: 978-0750613460**
- Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
- **Val Robertson, Alex Ward, John Low, AnnReed. Electrotherapyexplained: Principles & practice 4th edition, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437**

Reference Book (s)

- **SusanL. Michlovitz. ThermalAgents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653**
- **David J. Magee. Orthopedic Physical Assessment 5th edition, Elsevier Health Sciences, 2008, ISBN: 978-0721605715**

Name of the course	Critique inquiry, case presentation and discussion (Lab)
Course Code	BPHY7009
Prerequisite	
Corequisite	
Antirequisite	

	L	T	P	C
	0	0	1	0.5

Butterworth-Heinemann publishers, 2006,
ISBN: 978-0750688437

Course Objectives

1.To discuss case presentation

Course Outcomes

CO1	Understanding of critique inquiry
CO2	Understanding of concept of case presentation

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	00	00	50

Reference Book (s)

- **SusanL. Michlovitz. ThermalAgents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653**
- **David J. Magee. Orthopedic Physical Assessment 5th edition, Elsevier Health Sciences, 2008, ISBN: 978-0721605715**

Course Contents:

Unit-1
Concept of Critique inquiry
Unit-2
Musculoskeletal, neurological, cardiothoracic, gynaecological and sports case presentation

Suggested reading

Text Book (s):

- Textbook of rehabilitation by S. Sunders
- **Tidy's Physiotherapy, 12th edision, Ann M. Thomson, Alison T. Skinner, Joan Piercy, Butterworth-Heinemann, 1991, ISBN: 978-0750613460**
- **Principles & practice 4th edition,**

Course Content:

Name of The Course	PHYSIOTHERAPY IN CARDIOVASCULAR, PULMONARY & INTENSIVE CARE			
Course Code	BPHY8001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To study

- Evaluation, Clinical reasoning and Documentation for cardiac and pulmonary disorders and patients.
- The rehabilitation of cardiac and pulmonary cases.

Course Outcomes

CO1	To understand the principles of evaluate the cardiac or pulmonary patients.
CO2	To demonstrate and implement various physiotherapy techniques for cardiopulmonary patients
CO3	To design and implement rehabilitation protocol for ICU patients
CO4	To study,design and implement rehabilitation protocol for pulmonary patients
CO5	To understand and implement rehabilitation protocol for Cardiac patients
CO6	To develop insight of recent advances in Cardiopulmonary management

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Unit-1: Introduction & Assessment**Introduction**

- Anatomical and Physiological differences between the Adult and Pediatric lung.

Assessment

- Bedside assessment of the patient-Adult & Pediatric.
- Investigations and tests – Exercise tolerance Testing – Cardiac & Pulmonary, Radiographs,
- PFT, ABG, ECG, Hematological and Biochemical Tests.

Unit-2 : Physio therapeutic techniques in cardiac and pulmonary rehabilitation

- Physiotherapy techniques to decrease the work of breathing – Measures to optimize the balance between energy supply and demand, positioning, Breathing re-education – Breathing control techniques, mechanical aids – IPPB, CPAP, BiPAP.
- Physiotherapy techniques to clear secretions – Hydration, Humidification & Nebulisation, Mobilization and Breathing exercises, Postural Drainage, Manual techniques – Percussion, Vibration and Shaking, Rib Springing, ACBT, Autogenic Drainage, Mechanical Aids – PEP, Flutter, IPPB, Facilitation of Cough and Huff, Nasopharyngeal Suctioning.

Unit-3: ICU Rehabilitation

- Respiratory failure – Oxygen Therapy and Mechanical Ventilation.
- Introduction to ICU : ICU monitoring – Apparatus, Airways and Tubes used in the ICU -Physiotherapy in the ICU – Common conditions in the ICU – Tetanus, Head Injury, Lung Disease, Pulmonary Oedema, Multiple Organ Failure, Neuromuscular Disease, Smoke Inhalation, Poisoning, Aspiration, Near Drowning, ARDS, Shock; Dealing with an Emergency Situation in the ICU.

- Neonatal and Pediatric Physiotherapy – Chest physiotherapy for children, The neonatal unit, Modifications of chest physiotherapy for specific neonatal disorders, Emergencies in the neonatal unit

Unit-4 :Pulmonary Rehabilitation

- Physiotherapy in Obstructive lung conditions.
- Physiotherapy in Restrictive lung conditions.
- Management of breathlessness.
- Physiotherapy following Lung surgeries
- Drug therapy – Drugs to prevent and treat inflammation, Drugs to treat Bronchospasm, Drugs to treat Breathlessness, Drugs to help sputum clearance, Drugs to inhibit coughing, Drugs to improve ventilation, Drugs to reduce pulmonary hypertension, Drug delivery doses, Inhalers and Nebulisers.

Unit-5 Cardiac Rehabilitation

- Physiotherapy management following cardiac surgeries.
- Physiotherapy management following PVD.
- Abdominal Surgeries - Management of Pulmonary Restorative Dysfunction following surgical procedures on Abdomen and Thorax.
- Management of Amputations following Diabetes, PVD - Prosthesis in amputations of lower limbs following ulcers and gangrenes.
- Home program and education of family members in patient care.
- Treatment, Response to exercise and Implications of Physiotherapy in the following disease conditions: Hypertension, Diabetes, Renal Failure and Obesity.
- Applied Yoga in Cardio-respiratory conditions

Unit- 6 : Recent advancements in PT in Cardiovascular, Pulmonary & ICU

- Recent guidelines of CPR
- New classification of COPD & Asthma in ACOS

- Exsufflation and Insufflation Technique for Airway Clearance.

Suggested Reading

5. **Donna L. Frownfelter. Chest physical therapy & pulmonary rehabilitation: an interdisciplinary approach, Yearbook Medical Publishers, 1978, ISBN: 9780815132967**
6. **Egan's Fundamentals of Respiratory Care 11ed**
7. **P J Mehta Practical medicine**
8. **Jennifer A. Pryor, Ammani S. Prasad. Physiotherapy for Respiratory and Cardiac Problems 4th revised edition, Churchill Livingstone, 2008, ISBN: 9780080449852**
9. **Tidys physiotherapy book**
10. **Joan E. Cash, Patricia Downie. Cash`s text book of General Medical & Surgical conditions for Physiotherapists, 2nd edition revised, , Mosby, ISBN: 978-0571140640**

Name of The Course	Community Physiotherapy			
Course Code	BPHY8002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

.To study the various communities based rehabilitation
 To study the basic knowledge and requirements of CBR, restoring function, and preventing disability.

Course Outcomes

CO1	To integrate the knowledge gained in community medicine and other areas with skills to apply these in clinical situations of health and disease and its prevention
CO2	To planning and management of CBR programmes and disability
CO3	To set treatment goals and apply the skills gained in rehabilitating and restoring functions.
CO4	To able to identify rehabilitation methods to prevent disabilities
CO5	To identify rehabilitation methods to prevent dysfunctions due to various disease conditions
CO6	Adapt recent advances in CBR

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction of rehabilitation and community 10Hours
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- **Rehabilitation:** Definition, Types.
- **Community:** Definition of Community, Multiplicity of Communities, The Community based approach, Community Entry strategies, CBR and Community development, Community initiated versus community oriented programme, Community participation and mobilization.
- **Introduction to Community Based Rehabilitation:** Definition, Historical review, Concept of CBR, Need for CBR, Difference between Institution based and Community based Rehabilitation, Objectives of CBR, Scope of CBR, Members of CBR team, Models of CBR.
- **Principles of Community based Rehabilitation.** W.H.O`s policies-about rural health care- concept of primary /tertiary health centers-district hospitals etc- Role of P.T.-Principles of a team work of Medical person/P.T./O.T. audiologist/speech therapist /P.&O./vocational guide in C.B.R. of physically handicapped person , Agencies involved in rehabilitation of physical handicapped - Legislation for physically handicapped. Concept of multipurpose health worker. Role of family members in the rehabilitation of a physically handicapped.

Unit II: Planning and management of CBR programmes and disability 8 Hours

- **Planning and management of CBR Programmes, CBR Programmed planning and management, Ownership and Governance, Decentralization and CBR, Management of CBR, Programmed sustainability, Communication and Coordination, Community participation, mobilization and awareness, CBR programme influence on promoting and developing public policies.**
- **Disability: Definition of Impairment, Handicap and Disability, Difference between impairment, handicap and disability, Causes of disability, Types**

of disability, Prevention of disability, Disability in developed countries, Disability in developing countries. Disability Surveys: Demography. Screening: Early detection of disabilities and developmental disorders, Prevention of disabilities- Types and levels.

Disability Evaluation: Introduction, What, Why and How to evaluate, Quantitative versus Qualitative data, Uses of evaluation findings

Unit III: Role of different organization in CBR

9Hours

- **Role of Government in CBR:** Laws, Policies, Programmes, Human Rights Policy, Present rehabilitation services, Legal aspects of rehabilitation.
- **Role of Social work in CBR:** Definition of social work, Methods of social work, History of social work, Role of social worker in rehabilitation.
- **Role of voluntary Organizations in CBR:** Charitable Organizations, Voluntary health agencies
 - National level and International NGO's, Multilateral and Bilateral agencies. International Health Organizations: WHO, UNICEF, UNDP, UNFPA, FAO, ILO, World bank, USAID, SIDA, DANIDA, Rockfeller, Ford foundation, CARE, RED CROSS.
- **National District Level Rehabilitation Programme:** Primary rehabilitation unit, Regional training center, District rehabilitation center, Primary Health center, Village rehabilitation worker, Anganwadi worker

Unit IV: Role of Physiotherapy in CBR

10Hours

- **Role of Physiotherapy in CBR:** Screening for disabilities, Prescribing exercise programme, Prescribing and devising low cost locally available assistive aids, Modifications physical and architectural barriers for disabled, Disability prevention, Strategies to improve ADL, Rehabilitation programmes for various neuro-musculoskeletal and cardiothoracic disabilities.
- **Screening and rehabilitation of paediatric disorders in the community:** Early detection of high risk babies, Maternal nutrition and education, Rehabilitation of Cerebral Palsy, Polio,

Downs Syndrome, Muscular Dystrophies etc., Prevention and rehabilitation of mental retardation and Behavioural disorders, Immunization programmes, Early intervention in high risk babies, Genetic counselling.

- **Extension services and mobile units:** Introduction, Need, Camp approach.
- **Vocational training in rehabilitation:** Introduction, Need, Vocational evaluation, Vocational rehabilitation services.
- **Geriatrics- Physiology of Aging /degenerative changes-**Musculoskeletal /Neuromotor /cardio
 - respiratory-/Metabolic, Endocrine, Cognitive, Immune systems. Role of Physio Therapy in Hospital based care, Half-way homes, Residential homes, Meals on wheels etc. Home for the aged, Institution based Geriatric Rehabilitation. Few conditions:- Alzheimer's disease, Dementia, Parkinson's Disease, Incontinence, Iatrogenic drug reactions, etc. Ethics of Geriatric Rehabilitation.

Unit V: Industrial Health & Ergonomics

8Hours

Occupational Hazards in the industrial area --

Accidents due to

- a. **Physical agents-e.g.-Heat/cold, light, noise, Vibration, U.V. radiation, Ionizing radiation,**
- b. **Chemical agents-Inhalation, local action, ingestion,**
- c. **Mechanical hazards-overuse/fatigue injuries due to ergonomic alteration & ergonomic evaluation of work place-mechanical stresses per hierarchy –**
 - i. **sedentary table work –executives, clerk,**
 - ii. **inappropriate seating arrangement-vehicle drivers**
 - iii. **constant standing- watchman-Defense forces, surgeons,**
 - iv. **Over-exertion in laborers,-common accidents –Role of P.T. -Stress management.**
 - v. **Psychological hazards- e.g.-executives, monotonicity & dissatisfaction in job, anxiety of work completion with quality, Role of P.T. in Industrial setup & Stress management- relaxation modes.**
 - vi. **Biological Hazards**

Unit VI Advances in CBR.....8 hours
Use of low cost technology for providing CBR Accessibility of physiotherapy in remote areas through telehealth Study of different projects like Youth for India

	L	T	P	C
	1	0	0	1

Course Objectives

- Enhancement of clinical reasoning skills
- Provision of opportunities for students to apply basic science & medical knowledge to clinical case presentations.
- Developing a habit of reflective practice.

Course Outcomes

CO1	Outline a physiotherapy healthcare service in a collaborative, ethical, client- centered and culturally responsive manner.
CO2	Identify and manage adverse events/near misses and minimize risk associated with physiotherapy assessment and intervention.

Suggested Reading

Text Book (s)

- **Preventive and Social Medicine. Reviewed by Rashmi Sharma. CBS Publishers and Distributors Pvt., Ltd : New Delhi, India. 2017.**
- **Textbook of Community Medicine (Preventive & Social Medicine) by Sunderlal (Author) ISBN-13: 978-8123914411. ISBN-10: 8123914415**

Reference Book (s)

- **Public Health and Preventive Medicine - "The RED BOOK", By AFMC, Pune in Collaboration with WHO India Office, New Delhi.**
- **Textbook of Community Medicine: Preventive and Social Medicine, by Sunderlal**
- **Foundation of Community Medicine. CM Dhaar, Rubbani**
- **Community Medicine (With Recent Advances) by Suryakantha AH, Jaypee Publications**
- **A Comprehensive textbook of Community Medicine, Mathur**
- **Principles & Practice of Community Medicine, Asma Rahim, Jaypee Publications**
- **A text book of family medicine, by Ian k MC Whinnry**
- **Textbook of Community & Social Pediatrics, SR Banerjee**

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

UNIT-1: Introduction to Evidence Based Practice

- a. Introduction to Evidence Based Practice: Definitions, Evidence Based Practice,
- b. Concepts of Evidence based Physiotherapy: Awareness, Consultation, Judgement, and Creativity
- c. Development of Evidence based knowledge, The Individual Professional, Professionals within a discipline, and Professionals across disciplines

- Evidence Based Practitioner: The Reflective Practitioner, The E Model, Using the E Model
- Finding the Evidence: Measuring outcomes in Evidence Based Practice, Measuring Health Outcomes, Measuring clinical outcomes, Inferential statistics and Causation

Searching for the Evidence: Asking Questions, Identifying different sources of evidence, Electronic Bibliographic databases and World Wide Web, Conducting a literature search. Step by-step search for evidence

UNIT-2: Assessing the evidence and systematically reviewing the evidence and economic evaluation

A. Assessing the Evidence: Evaluating the evidence; Levels of evidence in research using quantitative methods, Levels of evidence classification system, Outcome Measurement,

Name of The Course	CLINICAL REASONING AND EVIDENCE BASED PHYSIOTHERAPY PRACTICE
Course Code	BPHY8003
Prerequisite	
Co-requisite	
Anti-requisite	

Biostatistics, The critical review of research using qualitative methods.

B. Systematically reviewing the evidence: Stages of systematic reviews, Meta-analysis, The Cochrane collaboration.

C. Economic evaluation of the evidence: Types of economic evaluation, conducting economic evaluation, critically reviewing economic evaluation, locating economic evaluation in the literature

D. Using the evidence: Building evidence in practice; Critically Appraised Topics (CATs), CAT format, Using CATs, Drawbacks of CATs

Suggested Reading:

• Practical Evidence-Based Physiotherapy 2nd edition, Churchill Livingstone, 2011, ISBN: 978-0-7020-4270-6

• Clinical Reasoning for Manual Therapists 1st Edition, Butterworth-Heinemann, 2003, ISBN-10: 0750639067, ISBN-13: 978-0750639064

• Practical Evidence-Based Physiotherapy 1st Edition, Butterworth-Heinemann, 2005, eBook ISBN: 9780702039133, Paperback ISBN: 9780750688208

Name of The Course	BPHY8004			
Course Code	Administration and Teaching Skills			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

1. The students will understand the basic issues of Management & Administration Practice as an informed professional on Legal & ethical issues
2. Understand the Dynamics of teaching & learning Plan effective teaching sessions in Physiotherapy.

Course Outcomes

CO1	To use and learn terminology and language associated with administration
CO2	To interpret the normal Administration-principles based on the Goal & Functions at large hospital set up / domiciliary services/ private clinic /academic institute.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction

1. Branches of administration, Nature and scope of administration, How to be an effective administrator, Planning hospital administration as part of a balanced health care program.
2. Principles of hospital administration and its applications to physiotherapy.
3. Planning and organization: Planning cycle, Principles of organizational charts, Resource and quality management, planning change –innovation
4. Financial issues including budget and income generation

Aims of physiotherapy education

1. Measurement and evaluation
2. Guidance and counseling
3. Faculty development program
4. Administration in clinical setting
5. Use of A-V aids in teaching
6. Taxonomy of education

Unit II: Hospital Administration

1. Hospital administration: Organization, Staffing, Information, Communication, Coordination, Cost of services, Monitoring and evaluation.
2. Organization of physiotherapy department: Planning, Space, Manpower, Other basic resources.
3. Organizing meetings, committees, and negotiations
4. Personnel management: Personnel performance appraisal system, Quality care delivery from the staff.
5. Concepts of teaching and learning
6. Curriculum development
7. Principles and methods of academic and clinical teaching

Suggested Reading

1. [John Loughran](#), Developing a Pedagogy of Teacher Education: Understanding Teaching & Learning about Teaching, Routledge publishers, 2013, ISBN: 1134210590, 9781134210596.
2. N.K.Singh, Human Resource Management, Excel Books publishers, 2002, ISBN: 8174461604, 9788174461605.
3. Physical therapy administration and management, Published for the American Physical Therapy Association by Williams & Wilkins, 1982 ISBN: 0683039768, 9780683039764.
4. Nosse Lorry J., Management Principles for physiotherapists, Publisher Lippincott Williams & Wilkins, 2005 ISBN: 0781742617, 9780781742610.
5. Kunders, G.D. , Hospital: planning, design & management, Publisher Tata McGraw-Hill Publishing Company, 1998 ISBN: 0074622110, 9780074622117.
6. Marry C. Herring, Handbook of Technological pedagogical content knowledge

Name of The Course	BPHY8005			
Course Code	Research Project			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

The student is expected to study the basic principles and application of

1. Enumerate the steps of research process
2. Explain the different research methods
3. Describe the importance and use bio-statistics for research work
4. Acquire skills to review literature, formulate problems, research writing and publishing.

Course Outcomes

CO1	To assess the appropriateness of different kinds of research designs and methodology for instance in terms of their appropriateness, transparency and quality
CO2	Propose a research study and justify the theory as well as the methodological decisions, including sampling and measurement and Choose appropriate quantitative or qualitative method to collect data.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Research in Physiotherapy
<ul style="list-style-type: none"> ❖ Introduction ❖ Clinical research for Physiotherapist: Why? How? And When? ❖ Research – types, concept, definition. ❖ Evidence-based practice, levels of evidence ❖ Direct and indirect measurement variables. ❖ Reliability and validity. ❖ Qualitative & Quantitative, Discrete and Continuous Variables

Unit II: Sampling And Presentation Of Data and Biostatistics

- ❖ Tabular Presentation of Data- Statistical Table, Format of a Table.
 - ❖ Frequency Distribution – construction of Frequency Distribution, cumulative and relative frequency distribution
 - ❖ Diagrammatic Presentation of Data - Bar Diagrams, Pie Diagram, Line Diagram
 - ❖ Graphical representation of a Frequency distribution – Histogram, Frequency.
 - ❖ Methods of Sampling.
 - ❖ Sampling Distribution, Standard error, null hypothesis, alternative hypothesis,
- Measures of central tendency or measures of Location
- ❖ Mean, Median, Mode in ungrouped & grouped series.
- Measures of Dispersion or Variation
- ❖ Range, Mean Deviation, Standard Deviation.
 - ❖ Z test, t test (paired & unpaired), chi-square test.
 - ❖ Estimation of confidence limits & intervals
 - ❖ Correlation
 - ❖ Bivariate distribution,
 - ❖ Scatter diagram,
 - ❖ Coefficient of correlation,
 - ❖ Calculation & interpretation of correlation coefficient

Suggested Reading

1. Carolyn M. Hicks. Practical Research Methods for Physiotherapists, Churchill Livingstone, 1988, ISBN: 978-0443037573
2. Mitchell Batavia. Clinical Research for Health Professionals: A User-Friendly Guide 1st edition, Butterworth-Heinemann, 2000, ISBN: 978-0750671934
3. B.K. Mahajan. Methods in Biostatistics 6th edition, Jaypee Brothers Publishers, 2002, ISBN: 9788171795208.

Name of The Course	Physiotherapy in cardiovascular, pulmonary & intensive care lab			
Course Code	BPHY8006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	5	2.5

Course Objectives

To study

1. Common Investigations for cardiac and Pulmonary Disorders.
2. Evaluation, Clinical reasoning and Documentation for cardiac and pulmonary disorders and patients for general surgery.

Course Outcomes

CO1	Evaluate the patients with cardiac or pulmonary disorders.
CO2	To design and implement various physiotherapy techniques for cardiopulmonary patients.
CO3	To demonstrate and implement rehabilitation protocol for ICU patients.
CO4	To design and implement rehabilitation protocol for pulmonary patients.
CO5	To design and implement rehabilitation protocol for Cardiac patients.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practicals :
1. Demonstration of basic principles of assessment of a surgical case.
2. Demonstration of auscultation of cardiac and pulmonary system.
3. Demonstration of techniques of breathing exercises.
4. Demonstration of importance of various artificial airways.
5. Demonstration of importance of different body positions.
6. Demonstration of various scales to measure dyspnea.
7. Demonstration of techniques of Airway clearance.
8. Demonstration of exercise capacity.
9. Demonstration of principles of cardiac rehabilitation
10. Demonstration of principles of pulmonary rehabilitation

Suggested Reading

11. Donna L. Frownfelter. Chest physical therapy & pulmonary rehabilitation: an interdisciplinary approach, Yearbook Medical Publishers, 1978, ISBN: 9780815132967
12. Egan's Fundamentals of Respiratory Care 11ed
13. Jennifer A. Pryor, Ammani S. Prasad. Physiotherapy for Respiratory and Cardiac Problems 4th revised edition, Churchill Livingstone, 2008, ISBN: 9780080449852
14. Tidys physiotherapy book
15. Joan E. Cash, Patricia Downie. Cash`s text book of General Medical & Surgical conditions for Physiotherapists, 2nd edition revised, , Mosby, ISBN: 978-0571140640
16. P J Mehta Practical medicine

Name of The Course	Community PT (LAB)			
Course Code	BPHY8007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	1.5

Course Objectives:

1.To Understand importance of community physiotherapy

2. To observe community problems

Course Outcomes

CO1	Evaluation of rural and urban patients
CO2	Identification of problems in rural healthcare system
CO3	Visit to regular mobile camps

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	00	00	50

Course Content:

LIST OF PRACTICALS

Practical 1	Field visit to urban and rural PHC's	
Practical 2	Field visit to regular mobile camps	
Practical 3	Demonstration of disability surveys in villages, and Disability screening	
Practical 4	Demonstration of Evaluation and Physiotherapy prescription techniques for musculoskeletal problems in community	• Principles & Practice of Community Medicine, Asma Rahim, Jaypee Publications
Practical 5	Demonstration of Evaluation and Physiotherapy prescription techniques for neuromuscular problems in community	• A text book of family medicine, by Ian k MC Whinnry
Practical 6	Demonstration of Evaluation and Physiotherapy prescription techniques for cardio-respiratory problems in community	• Textbook of Community & Social Pediatrics, SR Banerjee

Practical 7	Demonstration of Evaluation and Physiotherapy problems in community
Practical 8	Demonstration of Evaluation and Physiotherapy problems in community
Practical 9	Demonstration of Evaluation and Physiotherapy problems in community
Practical 10	Demonstration of evaluation and prescription techniques for musculoskeletal problems in community
Practical 11	Fabrication of low cost assistive devices with community resources

Text Book (s)

- Preventive and Social Medicine. Reviewed by Rashmi Sharma. CBS Publishers and Distributors Pvt., Ltd : New Delhi, India. 2017.
- Textbook of Community Medicine (Preventive & Social Medicine) by Sunderlal (Author) ISBN-13: 978-8123914411. ISBN-10: 8123914415

Reference Book (s)

- Public Health and Preventive Medicine - "The RED BOOK", By AFMC, Pune in Collaboration with WHO India Office, New Delhi.
- Textbook of Community Medicine: Preventive and Social Medicine, by Sunderlal
- Foundation of Community Medicine. CM Dhaar, Rubbani
- Community Medicine (With Recent Advances) by Suryakantha AH, Jaypee Publications

- A Comprehensive textbook of Community Medicine, Mathur
- Principles & Practice of Community Medicine, Asma Rahim, Jaypee Publications
- A text book of family medicine, by Ian k MC Whinnry
- Textbook of Community & Social Pediatrics, SR Banerjee

Name of The Course	CLINICAL REASONING & EVIDENCE BASED PHYSIOTHERAPY PRACTICE - (Lab)			
Course Code	BPHY8008			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	1	0.5

Course Objectives

- To promote clinical reasoning skills
- Provide opportunities for students to apply basic science & medical knowledge to clinical case presentations.
- To Develop habit of reflective practice.

Course Outcomes

CO1	Outline a physiotherapy healthcare service in a collaborative, ethical, client- centered and culturally responsive manner.
CO2	Identify and manage adverse events/near misses and minimize risk associated with physiotherapy assessment and intervention.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<ol style="list-style-type: none"> Demonstration of basic principles of application of evidence based physical therapy in treatment of various general Surgical procedures. Demonstration of basic principles of application of evidence based physical therapy in treatment of various neurological Surgical procedures. Demonstration of basic principles of application of evidence based physical therapy in treatment of various orthopedic Surgical procedures. Practical demonstration of finding research evidences and evaluation for the same.
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<ol style="list-style-type: none"> Evaluate the effectiveness and efficacy of the evidence based practical techniques delivered to patients. Demonstration, justification and standardization to identify the most accurate diagnostic tests and the most effective interventions Evidence based Physiotherapy to promote the collection, interpretation and application of valid evidence in clinical decision making
<p>8. The evidence could be:</p> <p style="padding-left: 40px;">Clinician- reported</p>
<p>9. The evidence could be:</p> <p style="padding-left: 40px;">Patient- observed</p>
<p>10. The evidence could be:</p> <p style="padding-left: 40px;">Research-derived</p>

Suggested Reading

- Practical Evidence-Based Physiotherapy 2nd edition, Churchill Livingstone, 2011, ISBN: 978-0-7020-4270-6
- Clinical Reasoning for Manual Therapists 1st Edition, Butterworth-Heinemann, 2003, ISBN-10: 0750639067, ISBN-13: 978-0750639064
- Practical Evidence-Based Physiotherapy 1st Edition, Butterworth-Heinemann, 2005, eBook ISBN: 9780702039133, Paperback ISBN: 9780750688208

Name of The Course	BPHY8009			
Course Code	Administration and Teaching Skills (Lab)			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. The students will understand the basic issues of Management & Administration Practice as an informed professional on Legal & ethical issues

2. Understand the Dynamics of teaching & learning Plan effective teaching sessions in Physiotherapy.

Course Outcomes

CO1	Relate and apply professional and legal aspects into the practice
CO2	Apply management skills into the practice.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Practicals:
Practical 1: Formulate a management process using planning, organization, direction, controlling, decision-making for a physiotherapy department.
Practical 2: Prepare a quality assurance program for a running hospital.
Practical 3: Professional demonstration of verbal and non verbal communication for working place.
Practical 4: Formulate tests and interviews strategy for selection and recruitment process.
Practical 5: Prepare a topic curriculum according to taxonomy.
Practical 6: Demonstrate Blooms Taxonomy for subject and lesson plan.

Practical 7: Demonstrate the protocol of Guidance and counseling .
Practical 8: Demonstrate the protocol of Faculty development program .
Practical 9: Demonstrate the Use of A-V aids in teaching.
Practical 10: Demonstrate question paper formation according to Taxonomy of education .

Suggested Reading

7. John Loughran, Developing a Pedagogy of Teacher Education: Understanding Teaching & Learning about Teaching, Routledge publishers, 2013, ISBN: 1134210590, 9781134210596.
8. N.K.Singh, Human Resource Management, Excel Books publishers, 2002, ISBN: 8174461604, 9788174461605.
9. Physical therapy administration and management, Published for the American Physical Therapy Association by Williams & Wilkins, 1982 ISBN: 0683039768, 9780683039764.
10. Nosse Lorry J., Management Principles for physiotherapists, Publisher Lippincott Williams & Wilkins, 2005 ISBN: 0781742617, 9780781742610.
11. Kunders, G.D. , Hospital: planning, design & management, Publisher Tata McGraw-Hill Publishing Company, 1998 ISBN: 0074622110, 9780074622117.

Marry C. Herring, Handbook of Technological pedagogical content kn

Name of The Course	Clinical education (Project)			
Course Code	BPHY8011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	13	7.5

Course Objectives

1.To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the under-graduate program and across their career.

2.To ensure the attention of a student and make the more receptive such as group activities, interactive for a role-plays and clinical bed-side demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers.
CO2	Understanding the bedside assessment of a patient or to the course of the disease
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation.
CO5	Understanding basic knowledge of exercise therapy and its implementation
Co6	Understanding the recent advance techniques in the field of physiotherapy

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Contents:

Unit-1
The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre,

PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.

Unit-2

The student will also be briefed regarding information about a patient's clinical status including signs, symptoms, and course of a disease

Unit-3

Clinical visit to their respective professional department within the hospital.

Unit-4

The students will learn about the construction and principle of working of various electrotherapeutic modalities and will be explained the indications, contraindications and harmful effects of the same. They will be taught to perform a check for all modalities. This will enable the students to apply these modalities for therapeutic purpose efficiently.

Unit-5

Develop the skills of the students in areas like assessment of physical parameters (joint range of motion, muscle strength etc) and principles of exercise therapy (strengthening, stretching, goniometry etc) and its application.

Unit 6

8 hours

Hands on practice

- Mobilization
- Kinesiology taping
- Mulligan techniques
- Maitland techniques

Topic presentation

- Case presentation
- Presentation on new researches in the field of physiotherapy

- **workshop to be attended on**

- Recent advances & techniques in the field of physiotherapy
- Cardiopulmonary rehabilitation
- Neurological rehabilitation
- Physiotherapy rehabilitation

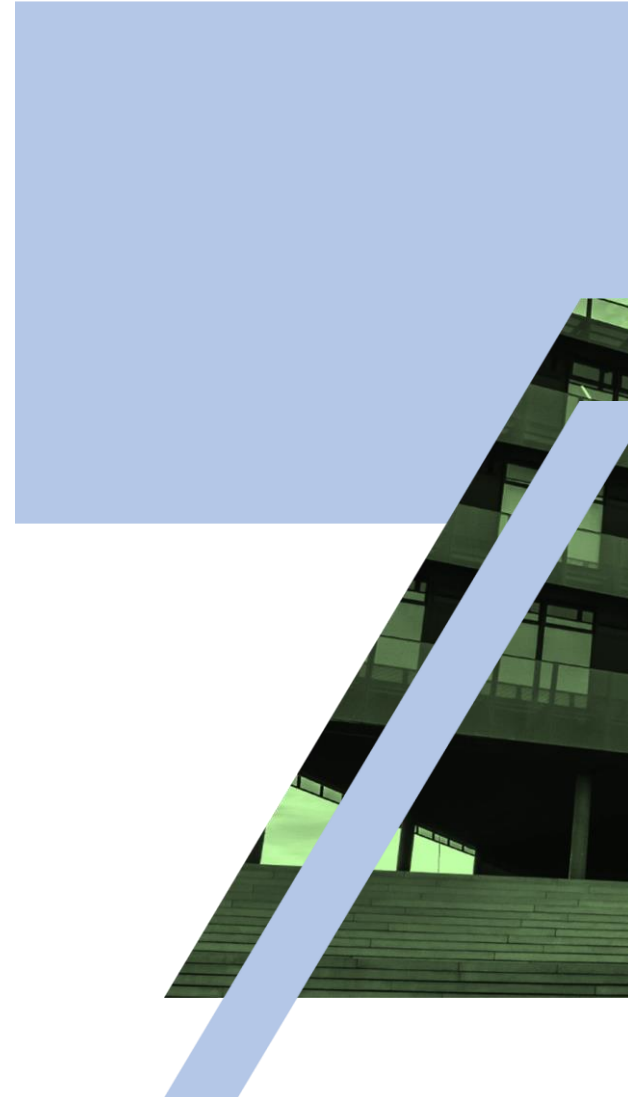
- **David J. Magee. Orthopaedic Physical Assessment 5th edition, Elsevier Health Sciences, 2008, ISBN: 978-0721605715**

Text Book (s):

- Textbook of rehabilitation by S. Sunders
- **Tidy's Physiotherapy, 12th edition, Ann M. Thomson, Alison T. Skinner, Joan Piercy, Butterworth-Heinemann, 1991, ISBN: 978-0750613460**
- Carolyn Kisner, Lynn Allen Colby.
Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
- **Val Robertson, Alex Ward, John Low, Ann Reed. Electrotherapy explained: Principles & practice 4th edition, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437**

Reference Book (s)

- **Susan L. Michlovitz. Thermal Agents in Rehabilitation, F a Davis Co, 1990, ISBN: 978-0803661653**



**Curriculum and syllabus
2020-2021**

**School of Medical and Allied sciences
Program: MPT (neurology)**

Vision: To be globally recognized for Physiotherapy education, interdisciplinary research and innovative therapeutic techniques for Rehabilitation.

Mission:

M1: Developing entrepreneurs in the healthcare domain.

M2: Collaborating with health care sector for development of curriculum, fundamentals and practical knowledge.

M3: Establishing centre of excellence in the field of evidence-based management and research.

Program Educational Objectives:

Graduate shall

PEO 1: engage in evidence-based treatment and collaborate with other professionals in multidisciplinary team.

PEO 2: take up higher education for career growth and research.

PEO 3: provide solutions for improving quality of life with effective physiotherapy rehabilitation.

Program Specific Objectives

Program Outcomes:

PO1: Physiotherapy Knowledge: Coursework entitles independent physiotherapy assessment and treatment in any healthcare delivery centers in India by the graduates

PO2: Problem Analysis: Evaluate patients for impairments and functional limitations and able to execute all routine physiotherapeutic procedures as per the evaluation

PO3: Design/development of solutions: The graduate shall utilize critical inquiry and evidence-based practice to make clinical decisions essential for autonomous practice

PO4:Leadership skills: The graduate shall demonstrate the leadership skills in performing societal and professional upliftment.

PO5: Professional Identity: Graduates can find employment opportunities in hospitals/nursing homes/sports teams/fitness centers/Community Rehabilitation /Health planning boards/health promotions services in both private and public sectors as well as in independent physiotherapy clinics

PO6: Physiotherapy and Society: The graduate shall function as an active member of professional and community organizations. The graduate will be a service-oriented advocate dedicated to the promotion and improvement of community health.

PO7: Basic Medical Knowledge: the graduates shall execute their basic medical knowledge in prevention, evaluation, treatment and rehabilitation of patient.

PO8: Ethics: The graduate shall be a competent and reflective physiotherapy practitioner who can function safely and effectively while adhering to legal, ethical and professional standards of practice in a multitude of physiotherapy settings for patients and clients across the lifespan and along the continuum of care from wellness and prevention to rehabilitation of dysfunction

PO9: Individual or Team work: The coursework is designed to train students to work as independent physiotherapists or in conjunction with a multidisciplinary team to diagnose and treat disorders as per the standard healthcare guidelines

PO10: Communication: Communicates and educates the individual's family, community, and other Professionals about positive health, prevention, wellness, and rehabilitation.

PO11: Physiotherapy patient evaluation and management: Coursework shall skill the graduate's physical/functional diagnosis, treatment planning, management, administration of physiotherapy treatment and for patient support

PO12: Life-long learning: The graduate shall demonstrate lifelong commitment to learning and professional development.

Detailed Syllabus
Of
MPT

School of Medical and Allied Sciences

Name of The Course	Professional Practice and Hospital Administration			
Course Code	MPTN5001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To Study

1. Principles of Management in field of Physiotherapy
2. The working environment of Hospital
3. Gain professional knowledge with respect to ethics & limitations of his/ her profession.

Course Outcomes

CO1	Apply physiotherapy ethics into the practice
CO2	Relate and apply professional and legal aspects into the practice
CO3	Apply management skills into the practice
CO4	Apply marketing skills into the practice
CO5	Understand the hospital management skill and apply it into the practice
CO6	Understand new healthcare trends

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<u>UNIT I:</u>	12 Lecture hours
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P.T Values and Ethics

- Development of Physiotherapy Profession
- Concept of Morality, Ethics and Legality.
- Rules of Professional conduct and Moral Implications.
- Communication skills, Client interest and Satisfaction.
- Inter Disciplinary Relation, Co-partnership, Mutual Respect, Confidence and communication, Responsibilities of the Physiotherapists, Status of Physiotherapist in Health Care.
- Role of Professional in Socio-Personal and Socio-Economic conditions.

Ethics of various organizations

- Need of Council Act for regulation of Professional Practice, Self-Regulatory role of Professional Association.
- Constitution and Functions of IAP.
- World Confederation of Physical therapists(WCPT)

Unit II: Legal Concerns 12 Hours

P.T. Law and Legal Concepts

- Medico legal aspects of physical therapy, liability, informed consent negligence, malpractice, licensure, consumer protection act.
- Law of disability & discrimination, Confidentiality of the Patient's status.

Physiotherapy profession and staff roles

- Documentation of rehabilitation assessment and management using International Classification of Functioning Disability and Health (ICF).
- Future challenges in Physiotherapy.
- Roles of Physiotherapy Director, Physiotherapy Supervisor, Physiotherapy Assistant, Physiotherapy, Occupational therapist, Home Health Aide and Volunteer.
- Standardized tests and scales used in various types of cases for assessment and interpretation in Physiotherapy practice

Unit III: Management 12 Hours

Introduction

- Introduction, Evolution of management, Functions of management.
- Management process – planning, organization, direction, controlling .Decision-making.
- Quantitative methods of management: relevance of statistical and/ or techniques in management.

Personal Management

- Staffing Recruitment selection.
- Performance analysis and appraisal, Collective

<ul style="list-style-type: none"> bargaining. Job satisfaction Discipline.
Unit IV: Marketing 4Hours:
Marketing <ul style="list-style-type: none"> Market segmentation, Channels of distribution. Promotion, Consumer behavior, marketing research production, planning. Total Quality Management <ul style="list-style-type: none"> Quality assurance program in hospitals.
Unit V: Hospital Management 12 Hours
<ul style="list-style-type: none"> Introduction: Planning hospital administration as part of a balanced health care program. Principles of hospital administration and its applications to physiotherapy. Planning and organization: Planning cycle, Principles of organizational charts, Resource and quality management, Planning change –innovation. Hospital administration: Organization, Staffing, Information, Communication, Coordination, Cost of services, Monitoring and evaluation. Organization of physiotherapy department: Planning, Space, Manpower, Other basic resources. Hospital acquired infection.
Unit VI: Healthcare Trends 8 hours
<ol style="list-style-type: none"> Consumerism—One of The Biggest Disruptors in Healthcare Financial Performance Indicates the Ability of Healthcare Organizations to Survive Social Issues. As the business of providing healthcare becomes more complex

Suggested Reading

- Hickik Robert J, Physical Therapy Administration & Management 2nd edition, Williams & Wilkins, ISBN: 9780683039764
- G. D. Kunders, S. Gopinath, Asoka Katakam, Hospital: planning, design & management, Tata McGraw-Hill Publishing Company, ISBN: 9780074622117
- Larry J. Nosse, Deborah Friberg, Management Principles for physiotherapists, Lippincott Williams and Wilkins, ISBN-13: 978-0683065763

Name of The Course	RESEARCH METHODOLOGY AND BIostatISTICS			
Course Code	MPTN5002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To study the basic principles and application of

- Research writing and reviewing
- Biostatistics in Research
- Apply basic biostatistics in research

Course Outcomes

On completion of the course the student should be able to:

CO1	. Enumerate the steps of research process
CO2	Design the different research methods
CO3	Acquire skills to review literature, formulate problems, research writing and publishing
CO4	Apply basic biostatistics in research
CO5	Apply analytical statistical tests to analyze the result of research
CO6	To Analyse Recent Advances in Research Methodology and Biostatistics

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Research in physiotherapy 10 Hours	
<ul style="list-style-type: none"> • Introduction • Research – Definition, concept, purpose, approaches • Research for Physiotherapist: Why? How? And When? • Research Ethics: Main ethical issues in human subjects' research • Define measurement & Scales of measurement • Pilot Study, Types of variables • Measurement: Properties of measurement: reliability, validity, responsiveness, MCID. 	
Unit II: Research Design	6 Lecture
<ul style="list-style-type: none"> • Management, Evaluation and Rehabilitation of: • Spinal Cord Injury • Disorders of muscles • Design, instrumentation & analysis for quasi-experimental research • Design models utilized in Physiotherapy 	
Unit III: Research Proposal	12Hours
<ul style="list-style-type: none"> • Writing a Research Proposal, Critiquing a research article • Evaluating published research: looking at the evidence • Formulating a question, Operational Definition • Inclusion & Exclusion criteria • Data collection & analysis • Results, Interpretation, conclusion, discussion • Informed Consent • Limitations • Research Fundamentals 	
Unit IV: Biostatistics	12 Hours
<p>Introduction to Biostatistics</p> <ul style="list-style-type: none"> • Definition • Types & Application in Physiotherapy <p>Data</p> <ul style="list-style-type: none"> • Definition, Types, Presentation & Collection methods <p>Measures of central value</p> <ul style="list-style-type: none"> • Arithmetic mean, median, mode. Relationship between them • Partitioned values- Quartiles, Deciles, Percentiles • Graphical determination 	

<p>Measures of Dispersion</p> <ul style="list-style-type: none"> • Range • Mean Deviation • Standard Deviation <p>Normal Distribution Curve</p> <ul style="list-style-type: none"> • Properties of normal distribution • Standard normal distribution • Transformation of normal random variables. • Inverse transformation • Normal approximation of Bioaxial distribution. <p>Correlation analysis</p> <ul style="list-style-type: none"> • Bivariate distribution: • Scatter Diagram • Coefficient of correlation • Calculation & interpretation of correlational coefficient • T-test, Z-test, P-value <p>Regression analysis</p> <ul style="list-style-type: none"> • Lines of regression • Calculation of Regression coefficient 	
Unit V: Sampling	12Hours
<p>Sampling</p> <ul style="list-style-type: none"> • Methods of Sampling • Sampling distribution • Standard error • Types I & II error <p>Probability (in Brief)</p> <p>Hypothesis Testing</p> <ul style="list-style-type: none"> • Null Hypothesis • Alternative hypothesis • Acceptance & rejection of null Hypothesis • Level of significance <p>Parametric & non parametric tests</p> <ul style="list-style-type: none"> • Chi square test • Mann-Whitney U test • Wilcoxon Signed test • Kruskal-Wallis test • Friednam test • T-test/student T test • Analysis of variance 	
Unit VI: Recent Advances in Research Methodology And Biostatistics 8 Hours	
<ul style="list-style-type: none"> • Quantile Regression Methods • Longitudinal data analysis. 	

- Survival analysis.
- High dimensional data analysis and big data analysis.

Suggested Reading

- Elizabeth Domholdt: Rehabilitation Research: Principles and Applications (Elsevier Science Health Science Div, 2004)
- Carolyn M. Hicks: Practical Research Methods for Physiotherapists, Churchill Livingstone, 1988, ISBN: 978-0443037573

Name of The Course	BIOMECHANICS AND CLINICAL KINESIOLOGY			
Course Code	MPTN5003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To Study

1. Muscle, Joint structure and function
2. Joint complexes of upper and lower limb.
3. Physiology of exercise & its effect on various systems of body.

Course Outcomes

CO1	To apply the knowledge of neuromuscular biomechanical principles for assessing the physiotherapeutic requirement of the patient.
CO2	To apply the knowledge of upper limb joints biomechanics in evaluation and treatment of patients
CO3	To apply the knowledge of lower limb joints

	biomechanics in evaluation and treatment of patients
CO4	To apply the knowledge of tissue mechanics in evaluation and treatment of patients
CO5	To analyze the gait & Posture
CO6	To Analyse Mechanical Analysis Of Human Motion

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

UNIT I: Introduction to Neuro - muscular consideration of movement **8 Hours**

- Forces, Equilibrium, Levers: laws & mechanical advantage.
- Torque, Power,
- Strength & Endurance
- Reflex & Volitional movement, Reciprocal innervation & Inhibition.
- Clinical kinesiology of Posture

UNIT II: Joint Biomechanics - UL **9 Hours**

- Types of Joints
- Upper extremity

UNIT III: Joint Biomechanics – LL and Spine **15 Hours**

- Lower extremity
- Spine and thoracic cage

UNIT IV:Tissue Mechanics	10 Hours
<ul style="list-style-type: none"> Material properties, viscoelasticity, creep and stress relaxation, rate dependent properties, stress and strain curves. ➤ Bones ➤ Muscle ➤ Ligaments and tendons Biomechanics of Tissues and structures of the musculoskeletal system and clinical application 	
UNIT V:Gait	10 Hours
<ul style="list-style-type: none"> Kinetics and kinematic analysis of normal gait. Pathological posture & Pathological gait. Running Ergonomic Approach to lifting and handling, workspace and environment Patient Positioning, Body Mechanics and Transfer Techniques 	
UNIT VI:Mechanical Analysis Of Human Motion_ 8 Hours	
<ul style="list-style-type: none"> Force Velocity Momentum Leverage 	

Suggested Reading

- Margareta Nordin and Victor H. Frankle, Basic biomechanics of the musculoskeletal system 2nd edition, Lea and Febiger.
- Cynthia C Norkin, Pamela K Levangie, Joint Structure & Function: A comprehensive analysis, Jaypee Brothers, 2006
- Mc Ardle, Katch&Katch, Exercise Physiology ,Lippincott Williams and Wilkins, 2000.
- Kapandji& Matthew J Kendel, The Physiology of the Joints, Churchill Livingstone, 2008.
- Robert A. Roberts and Scott O Roberts William C Brown, Exercise Physiology: Exercise, Performance, and Clinical Applications, 1997.
- Scott O. Roberts, Peter Hanson, Clinical Exercise Testing and Prescription Theory and Applications, C RC Press, 1997.

Name of The Course	BIOMECHANICS AND CLINICAL KINESIOLOGY PRACTICAL			
Course Code	MPTN5004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

To study:

- And understand the basic principles of Biomechanics.
- And understand the basic principles of Exercise Physiology.

Course Outcomes

CO1	To demonstrate neuromuscular biomechanical principles for assessing the physiotherapeutic requirement of the patient.
CO2	To demonstrate upper and lower limb joints biomechanics in evaluation and treatment of patients

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

- ❖ To demonstrate biomechanics Shoulder joint
- ❖ To demonstrate biomechanics Elbow joint
- ❖ To demonstrate biomechanics Wrist joint

- ❖ To demonstrate biomechanics Hand
- ❖ To demonstrate biomechanics Hip joint
- ❖ To demonstrate biomechanics Knee joint
- ❖ To demonstrate biomechanics Ankle joint
- ❖ To demonstrate biomechanics Spine joint
- ❖ To demonstrate Kinetics and kinematics of gait and pathological gait
- ❖ To analyse posture

Suggested Reading

1. Margareta Nordin and Victor H. Frankle: Basic biomechanics of the musculoskeletal system , 2nd edition (Lea and Febiger)
2. Cynthia C Norkin, Pamela K Levangie: Joint Structure & Function: A comprehensive analysis (Jaypee Brothers, 2006)
3. Kapandji& Matthew J Kendel: The Physiology of the Joints (Churchill Livingstone, 2008)

Name of The Course	CLINICAL EDUCATION- I			
Course Code	MPTN5005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	20	10

Course Objectives

1. To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the post-graduate program and across their career
2. To ensure the attention of a student and make them more receptive such as group activities, interactive sessions, role plays, and clinical bed-sided demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers
CO2	Understanding the bedside assessment of a patient and its management
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation
CO5	Understanding basic knowledge of neuro-rehabilitation and its implementation
CO6	Understanding the recent advance techniques in neuro-rehabilitation and its application

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

Unit I: OPD visit	60 Hours
OPD, hospital and clinical visit or posting of the students to learn & upgrade their knowledge in the approach, assessment, diagnosis, and Physiotherapy management of patients visiting the department.	
Unit II: Application of Modalities	60 Hours
Application of various modalities and therapeutic techniques in neurological conditions	
Unit III: Collection Of Data	60 Hours
Approach to patient, collection of demographic data, art of history taking, bed-sides; OPD manners in relation to patient, general assessment of patient from therapeutic point of view, ability to find provisional diagnosis logically, and application of therapeutic skill learned.	
Unit IV: Rehabilitation Planning	60 Hours

Short term and long term goal planning in neurorehabilitation	
Unit V: Medical Records	60 Hours
Record keeping and exercise prescription in physiotherapy	
UNIT VI:Recent Advance Techniques	8 Hours
<ul style="list-style-type: none"> • Hands on practice in neuro-rehabilitation approach • Bobath/NDT • MRP • Vojta • Biofeedback • Vestibular Rehabilitation • Topic presentation • Case presentation of any case from their clinical visit 	

Course Code	MPTN5006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To study:

1. Various methods of assessment of the physical parameters like joint ROM, muscle strength etc.
2. The principles of exercise therapy e.g. relaxation, co-ordination, re-education, stretching, strengthening, active and passive movements, mobilization, goniometry.
3. The construction and principle of working of various electrotherapeutic modalities.

Course Outcomes

CO1	Apply the principles of basic exercise therapy.
CO2	Apply manual therapeutic techniques in patient treatment
CO3	Apply therapeutic currents in patient treatment
CO4	Apply thermal and electromagnetic modalities in patient treatment
CO5	Apply advanced electrotherapy in patient treatment
CO6	To Analyse Recent Advances in Therapeutic Techniques

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Suggested Reading

1. Kenneth W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
2. Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
3. Anne Shumway-Cook, Marjorie H. Woollacott, Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
4. Darcy A. Umphred, Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

Name of The Course	THERAPEUTIC TECHNIQUES
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Unit I: Therapeutic Techniques - I	10 Hours
Review of the following techniques.	
<ul style="list-style-type: none"> • Stretching and mobilization. • Balance and co-ordination exercises. • Introduction to Bronchial Hygiene Therapy. • Soft tissue manipulation • PNF- Principles • Under water Training 	
Unit II: Therapeutic Techniques - II	10 Hours
<ul style="list-style-type: none"> • Manual therapy –different schools of thought • Principles of Neurological approaches. • Facilitation and inhibition techniques • General Guidelines to be followed in Cardiac Rehabilitation, Pulmonary Rehabilitation, Burns Rehabilitation and Cancer Rehabilitation • Physiotherapy in common conditions of skin 	
Unit III: Therapeutics Currents	10 Hours
<ul style="list-style-type: none"> • General Review of low frequency currents : Faradic, galvanic, Electro diagnosis, TENS, • General Review of medium frequency currents: Interferential Therapy, Di-dynamic and Russian currents • Pain Gate Mechanism and its applications • EMG and NCV and Biofeedback • Pain (neurobiology, various theories ,modulation and management of pain) 	
Unit IV: Thermal Energy	10 Hours
<ul style="list-style-type: none"> • Heating Modalities • Cryotherapy • Ultrasound. • SWD • Electromagnetic Radiations • LASER, • MWD, • UVR and IRR 	
Unit V: Advanced Electrotherapy	12 Hours

- Shock Wave,
- LWD,
- Combination Therapy for diagnosis

UNIT VI: Recent Advances in Therapeutic Techniques
8 Hours

- Percutaneous electrical neural stimulation (PENS)
- Micro current therapy
- Extracorporeal shockwave therapy
- low intensity pulsed ultrasound (LIPUS)

Suggested Reading

1. Carolyn Kisner, Lynn Allen Colby, Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
2. M. Dena Gardiner, Principles of Exercise Therapy 4th edition, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
3. Robertson, Alex Ward, John Low, Ann Reed, Electro therapy explained: Principles & practice 4th edition, Val, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437
4. De Lisa, Manual of nerve condition velocity techniques – Raven press, New York, 1982

Name of The Course	PHYSIOTHERAPY DIAGNOSIS AND CLINICAL DECISION MAKING			
Course Code	MPTN5007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

1. About assessment & evaluation techniques in various disorders.
2. About the Interpretation of various clinical tests.

Course Outcomes

CO1	Apply the various physiotherapeutic procedures for clinical examination
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CO2	Apply various electrodiagnostic tools and interpret its result for patient evaluation
CO3	Interpret the result of various radiodiagnostic tools for patient evaluation
CO4	Evaluate functional disability and plan restoration of movement functions
CO5	Perform and interpret exercise stress testing, anthropometric test, PFT etc.
CO6	To Analyse Recent Advances in Physiotherapy Diagnosis

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: <u>Clinical Examinations</u>	10 Hours
<ul style="list-style-type: none"> Clinical examination in general and detection of movement dysfunction. Evaluation Methods, Special tests and Scales used in Musculoskeletal, Neurological and Cardiopulmonary disorders. Developmental screening, motor learning –motor control assessment. 	
Unit II: <u>Electrodiagnosis</u>	10 Hours
<ul style="list-style-type: none"> Biophysical measurements, physiotherapy modalities, techniques and approaches. EMG NCV Biofeedback 	
Unit III: <u>Radiodiagnosis</u>	10 Hours
Principles of imaging techniques related to neuromuscular, skeletal and cardiopulmonary disorders with interpretation.	
Unit IV: Disability Evaluation	12 Hours
Aids and appliances, adaptive functional devices to improve movement dysfunction.	

Physical disability evaluation and disability diagnosis. Evaluation of aging. Gait analysis and diagnosis.	
Unit V: Other tests	10 Hours
Exercise ECG testing and monitoring. Anthropometric measurements. Pulmonary function test Physical fitness assessment by Range of motion, Muscle strength, endurance and skills, Body consumption, Fitness test for sports.	
Unit VI: Recent Advances in Physiotherapy Diagnosis	
8 Hours	
<ul style="list-style-type: none"> Recent advances in magnetic resonance imaging for stroke diagnosis Biomarkers in Parkinson's disease 	

Suggested Reading

- Susan B. O'Sullivan, Thomas B. Schmitz, Physical Rehabilitation 5th Edition, F a Davis Company, 2007, ISBN: 9780803612471
- Robert A. Donatelli, Michael J. Wooden, Orthopaedic Physical Therapy 4th edition, Churchill Livingstone; 2009, ISBN: 978-0443069420
- Karim Khan, Brukner & Khan's Clinical Sports Medicine 4th edition, Peter Brukner, McGraw-Hill Medical, 2012, ISBN: 978-0070998131

Name of The Course	PEDAGOGY			
Course Code	MPTN5008			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

- Describe the various methods involved in teaching
- Apply these teaching principles in the imparting physiotherapy knowledge to students.

Course Outcomes

CO1	Apply concept of teaching and learning
CO2	Design curriculum
CO3	Apply principles and methods of teaching
CO4	Apply measurement and evaluation methods of teaching
CO5	Execute awareness program
CO6	Discuss latest TLP

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Concept of Teaching and Learning 7 Hours	
<ul style="list-style-type: none"> • Meaning and scope of Educational Psychology. • Psychology of education • Meaning and Relationship between teaching and learning. • Learning Theories. • Dynamics of behavior. 	
Unit II: Curriculum	7Hours
<ul style="list-style-type: none"> • Basis of curriculum formulation. • Framing objectives for curriculum. • Process of curriculum development and factors involved. • Evaluation of curriculum differences. • Curriculum planning – Integrated teaching, Problem based learning, Evidence based medicine. • Skill development- Clinical skills, Communication skills, counseling skills. 	
Unit III: Principles and Methods of Teaching 7 Hours	
<ul style="list-style-type: none"> • Bloom's taxonomy of instructional objectives. • Writing instructional objectives in behavioral terms. • Planning of teaching: Unit planning, Lesson planning. • Lecture, Demonstration Discussion, Seminar, Assignment. • Types of teaching aids. 	

Unit IV: Measurement and Evaluation 9 Hours

- Nature of educational measurement: meaning, process, types of tests.
- Construction of an achievement test and its analysis.
- Standardized & Non-standardized test.
- Introduction of some standardized tools important tests of intelligence.
- Aptitude and personality.
- Continuous and comprehensive evaluation.
- Project evaluation, Classroom teaching, Written test.

Unit V: Guidance, counseling and Awareness Programme 7 Hours

- Meaning & concepts of guidance and counseling.
- Principles of guidance and counseling.
- Awareness and guidance to the common people about health and diseases.
- Philosophy, principles and concepts, guidance and counseling services of students and faculty.
- Faculty development and development of personnel for PT services.

Unit VI: Latest trends in Pedagogy 8 hours

1. Competency-Based Learning
2. Underground Education

Suggested Reading

1. John Loughran, Routledge: Developing a Pedagogy of Teacher education: Understanding teaching and learning about teaching 1st edition, , ISBN-13: 978-0415367271
2. Mary Herring, Punya Mishra, Matthew Koehler: Handbook of Technological pedagogical content knowledge (TPCK) for educators 1st edition, , Published by The AACTE Committee on Innovation and Technology (Editor), ISBN-13: 978-0805863550

Name of The Course	THERAPEUTIC TECHNIQUES PRACTICAL			
Course Code	MPTN5009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	2

Course Objectives

1. Various methods of assessment of the physical parameters like joint ROM, muscle strength etc.
2. The principles of exercise therapy e.g. relaxation, co-ordination, re-education, stretching, strengthening, active and passive movements, mobilization, goniometry.
3. The construction and principle of working of various electrotherapeutic modalities.

Course Outcomes

CO1	Apply the principles of basic exercise therapy.
CO2	Apply manual therapeutic techniques in patient treatment
CO3	Apply therapeutic currents in patient treatment

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

<ol style="list-style-type: none"> 1. To study Basic exercise therapy 2. To study Manual therapy technique 3. To study Therapeutic currents 4. To study Electrical modalities 5. To study Advance electrotherapy

Suggested Reading

1. Carolyn Kisner, Lynn Allen Colby, Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747

2. M. Dena Gardiner, Principles of Exercise Therapy 4th edition, CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
3. Robertson, Alex Ward, John Low, Ann Reed, Electro therapy explained: Principles & practice 4th edition, Val, Butterworth-Heinemann publishers, 2006, ISBN: 978-0750688437
4. De Lisa, Manual of nerve condition velocity techniques – Raven press, New York, 1982
5. Kimura J, Electrodiagnosis in diseases of nerve and muscle, F.A Davis, Philadelphia

Name of The Course	PHYSIOTHERAPY DIAGNOSIS AND CLINICAL DECISION MAKING PRACTICALS			
Course Code	MPTN5010			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	2

Course Objectives

1. About assessment & evaluation techniques in various disorders.
2. About the Interpretation of various clinical tests.

Course Outcomes

CO1	Apply the various physiotherapeutic procedures for clinical examination
CO2	Apply various electrodiagnostic tools and interpret its result for patient evaluation
CO3	Interpret the result of various radiodiagnostic tools for patient evaluation

Continuous Assessment Pattern

Internal Assessment	Mid Term Exam (MTE)	End Term Exam	Total Marks
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(IA)		(ETE)	
30	-	70	100

Course Content:

<ol style="list-style-type: none"> To study Clinical Examinations To study Electrodiagnosis To study Radiodiagnosis To study Disability Evaluation To study Other tests: ECG Exercise testing, PFT, anthropometry, etc

Suggested Reading

- Susan B. O'Sullivan, Thomas B. Schmitz, Physical Rehabilitation 5th Edition, F a Davis Company, 2007, ISBN: 9780803612471
- Robert A. Donatelli, Michael J. Wooden, Orthopaedic Physical Therapy 4th edition, Churchill Livingstone; 2009, ISBN: 978-0443069420
- Karim Khan, Brukner & Khan's Clinical Sports Medicine 4th edition, Peter Brukner, McGraw-Hill Medical, 2012, ISBN: 978-0070998131

Name of The Course	CLINICAL EDUCATION- II			
Course Code	MPTN5011			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	20	10

Course Objectives

- To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the post-graduate program and across their career
- To ensure the attention of a student and make them more receptive such as group activities, interactive sessions, role plays, and clinical bed-sided demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers
CO2	Understanding the bedside assessment of a patient and its management
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation
CO5	Understanding basic knowledge of neuro-rehabilitation and its implementation
CO6	Understanding the recent advance techniques in neuro-rehabilitation and its application

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

Unit I: OPD visit	60 Hours
OPD, hospital and clinical visit or posting of the students to learn & upgrade their knowledge in the approach, assessment, diagnosis, and Physiotherapy management of patients visiting the department.	
Unit II: Application of Modalities	60 Hours
Application of various modalities and therapeutic techniques in neurological conditions	
Unit III: Collection Of Data	60 Hours
Approach to patient, collection of demographic data, art of history taking, bedside; OPD manners in relation to patient, general assessment of patient from therapeutic point of view, ability to find provisional diagnosis logically, and application of therapeutic skill learned.	
Unit IV: Rehabilitation Planning	60 Hours

Short term and long term goal planning in Neurorehabilitation
Unit V: Medical Records 60 Hours
Record keeping and exercise prescription in physiotherapy
UNIT VI:Recent Advance Techniques 8 Hours
<ul style="list-style-type: none"> • Hands on practice in neuro-rehabilitation approach • Bobath/NDT • MRP • Vojta • Biofeedback • Vestibular Rehabilitation • Topic presentation • Case presentation of any case from their clinical visit

Suggested Reading

1. Kenneth W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
2. Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
3. Anne Shumway-Cook, Marjorie H. Woollacott, Motor Control: theory& practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
4. Darcy A. Umphred, Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

Name of The Course	Medical record keeping			
Course Code	MPTN5012			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

1. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the nervous system, and endocrine system.
2. Apply suffixes, prefixes, and combining roots in physiotherapy profession.
3. Interpret the medical records on health record system.

Course Outcomes

CO1	To identify terminology related to the health care and physiotherapy profession.
CO2	To apply suffixes, prefixes, and combining roots in physiotherapy profession
CO3	Interpret basic medical abbreviations/symbols in physiotherapy profession and healthcare system.
CO4	Utilize diagnostic, surgical, and procedural terms and abbreviations related to the nervous system, and endocrine system.
CO5	Interpret medical records/report on electronic health record system.
CO6	To AnalyseRecent Advances In Medical Record Keeping.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Basic medical terms in health care and physiotherapy	6 Hours
Derivation of medical terms: Define word roots, prefixes, and suffixes. Conventions for combined morphemes and the formation of plurals. Basic medical terms in health care and physiotherapy.	
Unit II: Interpret basic medical abbreviations	6 Hours

Course Objectives

Form medical terms utilizing roots, suffixes, prefixes, and combining roots. Interpret basic medical abbreviations/symbols.
Unit III: Procedural terms and abbreviations to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system 6 Hours
Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system,
Unit IV: Procedural terms and abbreviations to the Nervous and endocrine system 6 Hours
Utilize diagnostic, surgical, and procedural terms and abbreviations related to the nervous system, and endocrine system.
Unit V: Interpret medical records/reports 6 Hours
Interpret medical records/reports. Data entry and management on electronic health record system
Unit VI: Recent Advances In Medical Record Keeping 8 Hours
<ul style="list-style-type: none"> • Patient Flow Software • Real-time Locating Systems

Suggested Reading

Betsy J. Shiland. Medical Terminology for Mastering Healthcare Terminology Textbook. 6/e, 2018, Elsevier.

Davi-Ellen Chabner, Medical Terminology: A Short Course, 8th Edition, 2018, Elsevier. ISBN Number 9780323444927

Name of The Course	EMERGENCY CARE
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Course Code	MPTN5013			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. To understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
2. To help prevent harm to workers, property, the environment and the general public.
3. To provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes

Course Outcomes

CO1	Illustrate the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
CO2	Relate provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes.
CO3	To interpret knowledge on the principles of on-site disaster management

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
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10	20	70	100
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Course Content:

Unit I: Concepts of Quality of Care and guidelines of NABH	10 Hours
Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools, Introduction to NABH guidelines	
Unit II: Emergency care and BLS	10 Hours
<ul style="list-style-type: none"> • Vital signs and primary assessment • Basic emergency care – first aid and triage • Ventilations including use of bag-valve-masks (BVMs) • Choking, rescue breathing methods • One- and Two-rescuer CPR • Using an AED (Automated external defibrillator). • Managing an emergency including moving a patient 	
Unit III: Bio medical waste management and environment safety/disaster management	10 Hours
<ul style="list-style-type: none"> • Definition of Biomedical Waste • Waste minimization • BMW – Segregation, collection, transportation, treatment and disposal (including color coding) • Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste • BMW Management & methods of disinfection • Modern technology for handling BMW • Use of Personal protective equipment (PPE) • Monitoring & controlling of cross infection (Protective devices) • Fundamentals of emergency management • Psychological impact management • Resource management • Preparedness and risk reduction, • Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms. 	

Suggested Reading

1. CM Francis, Mario C De Souza. Hospital Administration, 3/e, 2004, JappeBrothers, ISBN9788171797219
2. Aspi F Golwalla, Sharukh A Golwalla. A Handbook of Emergencies, 8/e, 2015, JappeBrothers, ISBN9789351524724
3. Singh Anantpreet, Kaur Sukhjit, **Biomedical Waste Disposal**. 1/e, 2008, JappeBrothers, ISBN9789350255544

Name of The Course	NEUROLOGICAL DISORDERS-I			
Course Code	MPTN6001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

1. The clinical examination of a neurological patient.
2. The various circulatory, inflammatory, metabolic, degenerative, traumatic, autonomic disorders of the nervous system.
3. The etio-pathogenesis, the clinical features, management of various adult and child Psychiatric disorders and mental deficiencies.

Course Outcomes

CO1	To evaluate the various neurological dysfunctions clinically and utilize the clinical knowledge in diagnosis and management of disorders of cerebral circulation.
CO2	To utilize the clinical knowledge in diagnosis and management of inflammatory, demyelinating and extra pyramidal syndromes.
CO3	Illustrate and demonstrate the cause, pathology, signs-symptoms, differential diagnosis and management of spinal cord disorders and various degenerative disorders

CO4	To demonstrate the cause, pathology, signs-symptoms, differential diagnosis and management of peripheral nerve disorders and muscle and neuro-muscular joint disorders.
CO5	To relate various psychological dysfunctions with neurological conditions.
CO6	Analyze mental Disorders

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<p>Unit I: Clinical examination of a neurological patient Disorders of cerebral circulation 10 Hours</p> <ul style="list-style-type: none"> • General manifestations • Principles of diagnosis & management • Headache, migraine, raised intra-cranial pressure (Brief description) • Cranial Nerves and special senses. • Ischaemia, • Haemorrhages (CVA) • HT Encephalopathy
<p>Unit II: Inflammatory conditions, Demyelinating diseases, Extra pyramidal syndromes, Convulsive disorders 10 Hours</p> <ul style="list-style-type: none"> • Meningitis (bacterial), viral encephalitis • Acute disseminated encephalomyelitis, multiple sclerosis, GB syndrome, AIDP • Parkinson's disease, MSA, PSP • Chorea, Athetosis, Dystonia, Hemi-ballismus (in brief) • Epilepsy (GM, PM, Psychomotor), tetany
<p>Unit III: Disorders of Spinal cord and Cauda Equina, Autonomic nervous system, Development and degenerative syndromes 10 Hours</p> <ul style="list-style-type: none"> • Spinal cord injury • Spina-bifida, transverse myelitis • Neurogenic bladder and bowel. • Clinical features of autonomic disorders, autonomic dysreflexia and pain

- Cerebral palsy, kernicterus, hereditary ataxias, motor neuron disease, Spinal muscular atrophy, benign congenital hypotonia.

Unit IV: Peripheral nerve disorders, Muscle and Neuromuscular joint disorder 10 Hours:

- Traumatic/ compression or entrapment neuropathy, polyneuritis, diabetic polyneuropathy and spinal radiculopathies
- Special emphasis on brachial and lumbo-sacral plexus and their major branches – radial, ulnar, median, femoral and sciatic nerve
- Myasthenia gravis, floppy infant syndrome

Unit V: Introduction to Psychiatry, Psychosomatic reactions:

12 Hours

- Principles of psychiatric examination
- Modalities of Psychiatric treatment
- Stress and Depression
- Schizophrenia
- Alzheimer disease
- Hallucination, Delusion

Unit VI: Mental Disorders 8 Hours

- Paediatric mental health: child mental health assessment, anxiety and depression in child, conduct disorder, Attention deficit/hyperactivity disorder (ADHD), Tourette syndrome.
- Mood disorders: Bipolar disorder, cyclothymic disorders, Disruptive mood dysregulation disorder, Premenstrual dysphoric disorder
- Eating disorders: Anorexia nervosa, Bulimia nervosa, Binge eating disorder, PICA, Rumination disorder, avoidant food intake disorder.
- Personality disorders: OCD, Paranoid personality disorder, antisocial personality disorder

Suggested Reading

1. Michael Donaghy. Brain's Diseases of the Nervous system 12th edition, Oxford University Press, 2009, ISBN: 978-0198569381

- Kenneth W. Lindsay, Ian Bone, Geraint Fuller. Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
- Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston. Davidson's Principles & Practice of medicine 21st edition, Churchill Livingstone, 2010, ISBN: 978-0702030857
- Niraj Ahuja. A Short Textbook of Psychiatry, 6th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2006, ISBN: 9788180618710
- Michael Gelder, Paul Harrison, Philip Cowen. Shorter Oxford Text Book of Psychiatry 6th edition, OUP Oxford Publishers, 2006, ISBN: 978-0198566670

Name of The Course	PHYSIOTHERAPEUTICS IN NEUROLOGICAL DISORDERS- I			
Course Code	MPTN6002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

- Evaluation and examination of a patient with neurological pathology
- General outline of electro diagnostic procedures
- Interpretations and prognosis in different neurological conditions
- Principles of Physiotherapy at various stages of Rehabilitation, establishing the goals of rehabilitation and ADL training.

Course Outcomes

CO1	Relate the theories of Motor control and Motor learning during the planning of rehabilitation for various neurological conditions.
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CO2	To utilize the knowledge in understanding the assessment and physiotherapy management of Spinal Cord Injury and various Muscular Disorders
CO3	To demonstrate the knowledge in physiotherapy assessment and management of Peripheral and Cranial nerve disorders
CO4	To illustrate the physiotherapy assessment and management of Congenital, Autoimmune and Infectious disorders
CO5	Relate clinical signs and symptoms for the diagnosis and management of Cerebro-vascular disorders and Head Injury
CO6	Analyze Psychomotor Physiotherapeutic Approaches

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Motor Control theories and Its assessment link	
12 Hours	
<ul style="list-style-type: none"> Motor control, Theories of Motor Control and Motor Development, Neural Plasticity and clinical implication. Theories of Motor learning Principles of pediatric assessment, geriatric assessment 	
Unit II: Muscle and Spine disorders	10
Hours	
Management, Evaluation and Rehabilitation of: Spinal Cord Injury Disorders of muscles	

Unit III: Nerve injuries 10 Hours	
<ul style="list-style-type: none"> Disorders of Peripheral nerves Disorders of cranial nerves 	
Unit IV: Nervous injuries 10 Hours	
<ul style="list-style-type: none"> Management, Evaluation and Rehabilitation of: <ul style="list-style-type: none"> Congenital & hereditary Disorders Autoimmune disorders Infectious disorders of nervous system 	
Unit V: Head injuries 10 Hours	
<ul style="list-style-type: none"> Management, Evaluation and Rehabilitation of: <ul style="list-style-type: none"> Disorders of cerebral circulation Head Injury 	
Unit VI: Psychomotor Physiotherapeutic Approaches: 8 Hours	
<ul style="list-style-type: none"> Psychotherapeutic oriented approach for disorders such as schizophrenia, Personality disorder and eating disorder. Stress reduction programme: relaxation techniques, aqua therapy, Tai Chi. Guided Imagery techniques. Cognitive behavioral therapy. 	

Name of The Course	PHYSIOTHERAPEUTICS IN NEUROLOGICAL DISORDERS PRACTICAL-I			
Course Code	MPTN6003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

- Evaluation and examination of a patient with neurological pathology
- General outline of electro diagnostic procedures
- Interpretations and prognosis in different neurological conditions

Course Outcomes

CO1	To interpret the differential diagnosis of various neurological conditions.
CO2	To apply the various therapeutic techniques for the management of neurological conditions.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

- Review of General assessment
- Assessment of Higher mental functions
- Neurodevelopment assessment
- Pain assessment
- Sensory assessment
- Assessment of Tone, flexibility, tightness
- Motor Control assessment
- Muscle Length Testing**
- Postural assessment**
- Limb length measurement

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Suggested Reading

- Michael Donaghy, Brain's Diseases of the Nervous system 12th edition, Oxford University Press, 2009, ISBN: 978-0198569381
- Kenneth W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
- Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
- Anne Shumway-Cook, Marjorie H. Woollacott, Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
- Darcy A. Umphred, Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

- Range of Motion
- Balance assessment
- Coordination assessment
- Reflex Testing
- Cranial nerve testing
- Nerve Tension testing
- EMG/ NCV report reading & analysis
- Clinical Gait assessment
- Functional assessment

- Advance Physiotherapy Treatment approaches
 1. Neurodevelopment technique
 2. Bobath
 3. Vojta
 4. Brunnstrom
 5. PNF
 6. Rood's Approach
 7. Neural mobilisation

Name of The Course	PT CLINICALS – I			
	MPTN6004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	24	12

Course Objectives

1. To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the post-graduate program and across their career
2. To ensure the attention of a student and make them more receptive such as group activities, interactive sessions, role plays, and clinical bedside demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers
CO2	Understanding the bedside assessment of a patient and its management
CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation
CO5	Understanding basic knowledge of neuro-rehabilitation and its implementation
CO6	Understanding the recent advance techniques in neuro-rehabilitation and its application

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
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Suggested Reading

1. Michael Donaghy, Brain's Diseases of the Nervous system 12th edition, Michael Donaghy, Oxford University Press, 2009, ISBN: 978-0198569381
2. W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Kenneth Churchill Livingstone, 2010, ISBN: 978-0443069574
3. Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
4. Anne Shumway-Cook, Marjorie H. Woollacott, Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
5. Sophie Levitt, Treatment of Cerebral Palsy and Motor Delay 5th edition, Wiley-Blackwell, 2010, ISBN: 978-1405176163
6. Darcy A. Umphred, Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

30	-	70	100
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Course Content:

Unit I: OPD visit	72 Hours
OPD, hospital and clinical visit or posting of the students to learn & upgrade their knowledge in the approach, assessment, diagnosis, and Physiotherapy management of patients visiting the department.	
Unit II: Application of Modalities	72 Hours
Application of various modalities and therapeutic techniques in neurological conditions	
Unit III: Collection Of Data	72 Hours
Approach to patient, collection of demographic data, art of history taking, bedside; OPD manners in relation to patient, general assessment of patient from therapeutic point of view, ability to find provisional diagnosis logically, and application of therapeutic skill learned.	
Unit IV: Rehabilitation Planning	72 Hours
Short term and long term goal planning in neurorehabilitation	
Unit V: Medical Records	72 Hours
Record keeping and exercise prescription in physiotherapy	
UNIT VI:Recent Advance Techniques	8 Hours
<ul style="list-style-type: none"> • Hands on practice in neuro-rehabilitation approach • Bobath/NDT • MRP • Vojta • Biofeedback • Vestibular Rehabilitation • Topic presentation • Case presentation of any case from their clinical visit 	

Suggested Reading

1. Kenneth W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
2. Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
3. Anne Shumway-Cook, Marjorie H. Woollacott, Motor Control: theory & practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
4. Darcy A. Umphred, Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

Name of The Course	DIAGNOSTIC IMAGING			
Course Code	MPTN6005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. To aware of the indications and implications of commonly used diagnostic imaging tests as they pertain to patient's management.
2. Demonstrate the study of common diagnostic and therapeutic imaging tests.
3. The course will cover that how X-Ray, CT, MRI, Ultrasound and Other Medical Images are created and how they help the health professionals to save lives.

Course Outcomes

CO1	To illustrate the indications and implications
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	of commonly used diagnostic imaging tests as they pertain to patient's management.
CO2	Demonstrate the study of common diagnostic and therapeutic imaging tests.
CO3	To evaluate that how X-Ray, CT, MRI, Ultrasound and Other Medical Images are created and how they help the health professionals to save lives.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

Unit I: Introduction to Image Interpretation 10 Hours
<ul style="list-style-type: none"> • History <ul style="list-style-type: none"> ○ A New Kind of Ray ○ How a Medical Image Helps ○ What Imaging Studies Reveal ○ Radiography (x-rays) • Fluoroscopy • Computed Tomography (CT) • Magnetic Resonance Imaging (MRI) • Ultrasound • Endoscopy.
Unit II: Radiography And Mammography 10 Hours
<ul style="list-style-type: none"> • Equipment components • Procedures for Radiography & Mammography • Benefits versus Risks and Costs • Indications and contraindications
Unit III: Introduction to Fluoroscop, CT, MRI 10 Hours
<ul style="list-style-type: none"> • What is Fluoroscopy? • Equipment used for fluoroscopy • Indications and Contra indications • How it helps in diagnosis • The Findings in Fluoroscopy • Benefits versus Risks and Costs. • What is Computed Tomography <ul style="list-style-type: none"> ● Indications and Contra indications

- How it helps in diagnosis
- The Findings in Computed Tomography
- Benefits versus Risks and Costs.
- MRI
 - What is MRI?
 - Equipment used for MRI
 - Indications and Contra indications
 - How it helps in diagnosis
 - The Findings in MRI
 - Benefits versus Risks and Costs
 - Functional MRI.

Suggested Reading

1. **Plaats, G.J.**van der. A textbook for radiographers and Radiological Technicians, Churchill Livingstone, ISBN 978-94-009-8785-2
2. James Swain Kenneth Bush Juliette Brosing. Diagnostic Imaging for Physical Therapists, Saunders, 1st Edition, 2008 ISBN: 9781416029038
3. G Balachandran. MRI Spine in Low Backache Made Easy: for the General Practitioner, 1/e, 2012, Jaypee Brothers, ISBN: 9789350257142
 1. Govind B Chavan. MRI Made Easy (for Beginners), 2/e, 2013, Jaypee Brothers, ISBN: 9789350902707
4. Joseph H Introcaso. Musculoskeletal Ultrasound. 3/e , 2016, Jaypee Brothers, ISBN: 978935152933

Name of The Course	EVALUATION METHODS AND OUTCOME MEASURES			
Course Code	MPTN6006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. To describe and compare different health outcomes measures
2. To describe and compare different methods used to value health states
3. To analyze health outcomes data

Course Outcomes

CO1	Reflect on, evaluate and explain all stages of the physiotherapy process based on theoretical and practical knowledge, and assess if the patient should be referred to another care provider
CO2	To reflect on the choice of different methods when valuing health states
CO3	To reflect on multidisciplinary in population health studies

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: The physiotherapy process and ICF concerning disability

10 Hours

The physiotherapy process and ICF concerning disability, functioning and contextual factors including behavioral medical aspects in rehabilitation in different rehabilitation contexts

The role of the physiotherapist as caregiver, educationalist, consultant and team member

Evidence-based working method (published knowledge, best practice, the patient's wishes and available resources)

Contraindications for different examination and treatment methods

Gender, culture, diversity, laws and regulations and ethical rules

Physical activity in rehabilitation

Unit II: Clinical education with a focus on physiotherapy examination, assessment and treatment in rehabilitation of diseases/injuries in the musculoskeletal system

10 Hours

Movement habits and body positions, as well as behaviours and reference to problems triggering or tending to maintain pain conditions principles of differential diagnoses concerning joint, muscle and nerve involvement Hyper- and hypomobility and their causes Muscle function regarding strength, endurance, coordination, muscle length and pain treatment with devices and orthopedic technical aids

Unit III: Physiotherapy examination, assessment and treatment in rehabilitation of psychosomatic problems

10 Hours

Psychosomatic approach treatment, reflection and communication psychosomatic orientated examination with an emphasis on resource- and problem analysis psychosomatic-targeted treatment methods; body awareness, therapeutic touch, relaxation and stress management

+

Name of The Course	ADVANCE NEUROLOGICAL PHYSIOTHERAPY TECHNIQUES			
Course Code	MPTN6007			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To Study

1. About assessment & evaluation techniques in various disorders.
2. About the Interpretation of various clinical tests.

Course Outcomes

CO1	Assess and plan treatment for general neurological disorders
CO2	Assess motor learning and developmental screening
CO3	Perform advance neurological techniques
CO4	Analyze and diagnose abnormal gait
CO5	Perform evidence based practice in physiotherapy
CO6	Recent Advances in advance neurological physiotherapy techniques

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

UNIT I: Neurological Physiotherapy assessment 10 Hours
<ul style="list-style-type: none"> • General Neurological Physiotherapy assessment • Clinical decision making-planning effective treatment • Anthropometric measurements. • Special tests and Scales used in Neurological disorders.
Unit II: Motor Control Assessment 10Hours
<ul style="list-style-type: none"> • Developmental screening, motor learning –motor control assessment.
Unit III: Neuro Techniques 10 Hours
<ul style="list-style-type: none"> • Neurodevelopment technique • Bobath • Vojta

- Brunnstrom
- PNF
- Rood's Approach
- Neural mobilisation
-

Unit IV: Gait Analysis 10 Hours:

- Gait analysis and diagnosis.
- Aids and appliances, adaptive functional devices to improve movement dysfunction.

Unit V: Evidenced based practices in physiotherapy 12 Hours

- Evidenced based practices in physiotherapy
 - Principles of evidence based practices
 - Elements of evidences
 - Appraising the evidence

UNIT VI :Recent Advances Neurological Physiotherapy Techniques 8 Hours

- Rehab Robotics
- Gamifield Rehab
- Light therapy

Suggested Reading

1. Susan B. O'Sullivan, Thomas B. Schmitz, Physical Rehabilitation 5th Edition, F a Davis Company, 2007, ISBN: 9780803612471
2. Robert A. Donatelli, Michael J. Wooden, Orthopaedic Physical Therapy 4th edition, Churchill Livingstone; 2009, ISBN: 978-0443069420
3. Karim Khan, Brukner & Khan's Clinical Sports Medicine 4th edition, Peter Brukner, McGraw-Hill Medical, 2012, ISBN: 978-0070998131

Name of The Course	PHYSIOTHERAPEUTICS IN NEUROLOGY-II			
Course Code	MPTN6008			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

To study the

- Evaluation and examination of a patient with neurological pathology
- Principles of Physiotherapy at various stages of Rehabilitation, establishing the goals of rehabilitation and ADL training
- Advanced techniques related to rehabilitation of neurological patient.

Course Outcomes

On completion of the course the student should be able to:

CO1	Determine the rehabilitate of neurological patients
CO2	Demonstrate balance and coordination training to neurological patients
CO3	Evaluate and treat degenerative and movement disorders
CO4	Develop assessment and management program for Tumors, Reflex Sympathetic dystrophy and Epilepsy
CO5	Evaluate and treat post-surgical conditions
CO6	To study recent advances in physiotherapeutics in neurology-ii

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I:Gait Training 10 Hours

- Gait Training
- General principle of design and fall prevention strategies in geriatrics
- Assistive Technologies and its role in Neurorehabilitation
- Prosthetics and Orthotics in Neurorehabilitation
- Wheelchair skills- Basic & Advanced

Unit II:Balance Training 1Hours

- Balance & Coordination training
- Vestibular training
- Cognitive and Perceptual disorders
- Environmental modifications
- Group exercises

Unit III: Management, Evaluation and Rehabilitation 10Hours

- Degenerative disorders
- Movement disorders
- Balance disorders

Unit IV: Management, Evaluation and Rehabilitation II 10 Hours

- Metabolic & Nutritional disorders
- Disorders of nervous system due to drugs & chemical agents
- Tumors
- Epilepsy
- RSD

Unit V:Management, Evaluation and Rehabilitation III 12Hours

- Intracranial abscess
- Malformations of spine & spinal cord
- Surgeries for disc disorders
- Decompression surgeries for tumors
- Stereotactic surgery
- Image guided frameless stereotaxy
- Psychosurgery

Unit VI:Recent Advances In Physiotherapeutics In Neurology-II 8 Hours

- Virtual Reality based training
- Robotic training
- Vestibular Training

- Evaluation and examination of a patient with neurological pathology
- General outline of electro diagnostic procedures
- Interpretations and prognosis in different neurological conditions

Suggested Reading

1. MichaelDonaghy, Brain`s Diseasesof the Nervoussystem 12thedition, MichaelDonaghy, Oxford University Press, 2009, ISBN: 978-0198569381
2. W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Kenneth Churchill Livingstone, 2010, ISBN: 978-0443069574
3. Susan B.O`Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
4. Anne Shumway-Cook, Marjorie H. Woollacott, MotorControl:theory&practicalApplication 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
5. Sophie Levitt, Treatment of Cerebral Palsy and Motor Delay 5th edition, Wiley-Blackwell, 2010, ISBN: 978-1405176163
6. Darcy A. Umphred, NeurologicalRehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

Name of The Course	PHYSIOTHERAPEUTICS IN NEUROLOGY PRACTICAL -II			
Course Code	MPTN6009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

To Study:

Course Outcomes

CO1	To interpret the differential diagnosis of various neurological conditions.
CO2	To apply the various therapeutic techniques for the management of neurological conditions

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

- Concepts of advanced treatment techniques :
 1. Exercise prescription in ageing
 2. Positioning andhandling techniques forhead control and trunkcontrol in pediatrics
 3. Wheel chair skills
 4. Group exercises
 5. Balance & Coordination training
 6. Vestibular training
 7. Environmental modifications
 8. Group exercises
 9. Physiotherapy in home setting

Suggested Reading

- MichaelDonaghy, Brain`s Diseasesof the Nervoussystem 12thedition, MichaelDonaghy, Oxford University Press, 2009, ISBN: 978-0198569381
- W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Kenneth Churchill Livingstone, 2010, ISBN: 978-

0443069574

- Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
- Anne Shumway-Cook, Marjorie H. Woollacott, MotorControl:theory&practicalApplication 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
- Sophie Levitt, Treatment of Cerebral Palsy and Motor Delay 5th edition, Wiley-Blackwell, 2010, ISBN: 978-1405176163
- Darcy A. Umphred, NeurologicalRehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

Name of The Course	PT CLINICALS – II			
	MPTN6010			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	24	12

Course Objectives

1. To sensitize potential learners with essential knowledge, this will lay a sound foundation for their learning across the post-graduate program and across their career
2. To ensure the attention of a student and make them more receptive such as group activities, interactive sessions, role plays, and clinical bed-sided demonstrations.

Course Outcomes

CO1	Understanding of community and health care workers
CO2	Understanding the bedside assessment of a patient and its management

CO3	Understanding of different departments in a hospital
CO4	Understanding basic knowledge of modality and its implementation
CO5	Understanding basic knowledge of neuro-rehabilitation and its implementation
CO6	Understanding the recent advance techniques in neuro-rehabilitation and its application

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
30	-	70	100

Course Content:

Unit I: OPD visit	72 Hours
OPD, hospital and clinical visit or posting of the students to learn & upgrade their knowledge in the approach, assessment, diagnosis, and Physiotherapy management of patients visiting the department.	
Unit II: Application of Modalities	72 Hours
Application of various modalities and therapeutic techniques in neurological conditions	
Unit III: Collection Of Data	72 Hours
Approach to patient, collection of demographic data, art of history taking, bedside; OPD manners in relation to patient, general assessment of patient from therapeutic point of view, ability to find provisional diagnosis logically, and application of therapeutic skill learned.	
Unit IV: Rehabilitation Planning	72 Hours
Short term and long term goal planning in neurorehabilitation	
Unit V: Medical Records	72 Hours
Record keeping and exercise prescription in physiotherapy	

UNIT VI:Recent Advance Techniques	8
Hours	
<ul style="list-style-type: none"> • Hands on practice in neuro-rehabilitation approach • Bobath/NDT • MRP • Vojta • Biofeedback • Vestibular Rehabilitation • Topic presentation • Case presentation of any case from their clinical visit 	

To study

- Introduction writing
- Methodology writing
- Data Analysis writing
- Result writing
- Discussion writing

CO1	Understanding of How to write Introduction
CO2	Understanding of How to write Methodology
CO3	Understanding of How to write Data Analysis

Suggested Reading

1. Kenneth W. Lindsay, Ian Bone, Geraint Fuller, Neurology & Neurosurgery Illustrated 5th edition, Churchill Livingstone, 2010, ISBN: 978-0443069574
2. Susan B.O'Sullivan, Thomas J. Schmitz, Physical Rehabilitation 5th edition, F.A. Davis Company, 2006, ISBN: 978-0803612471
3. Anne Shumway-Cook, Marjorie H. Woollacott, Motor Control: theory& practical Application 2nd edition, Lippincott Williams & Wilkins, 2001, ISBN: 9780683306439
4. Darcy A. Umphred, Neurological Rehabilitation 5th edition, Mosby, 2006, ISBN: 978-0323033060

Course content

- Introduction
- Statement of Question
- Aim and Objective
- Significance of study
- Hypothesis
- Operational definition
- Review of Literature
- Methodology
- Data Analysis
- Result
- Discussion
- Conclusion
- Limitations #References
- Appendix

Name of The Course	DISSERTATION			
Course Code	MPTN6011			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Suggested Reading

1. Research in Education, 10th Edition Best & Kahn
2. Research Methodology C.R.KOTHAR
3. Methodology of Educational Research Lokesh Koul

Course Objectives



COURSE BOOK - 2020

Volume-xx

**Curriculum and syllabus
2020-2021**

**School of Medical and Allied Sciences
Program : Cardiovascular Technology**

Vision

To be known worldwide for education, innovation, interdisciplinary research and practice in the field of Cardiovascular Technology.

Mission

M1: Collaborate with Cardiology and Cardiothoracic department in the hospitals of national repute to align curriculum.

M2: Involve students in community health programmes to become an important resource in Cardiovascular health care.

M3: To be an important resource in Primary, Secondary and Tertiary chain of Cardiovascular Health care.

Program Educational Objectives

PEO1: Work as cardiovascular technicians under cardiology and cardiothoracic experts in mainstream of cardiac hospitals.

PEO2: Pursue higher studies in various specialization in cardiovascular technology.

PEO3: Engage in experiential entrepreneurship opportunities.

Program Specific Objectives

Program Outcomes

<p>PO1: Thinking Abilities Utilize the principles of scientific enquiry, thinking analytically, clearly and critically while solving problems and making decisions during daily practice. Identify correct procedural errors, identify instrument malfunctions and seek proper supervisory assistance and verify the accuracy of laboratory results obtained.</p>
<p>PO2: Planning Abilities Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.</p>
<p>PO3: Communication Communicate effectively with society at large, develop professional conduct and interpersonal communication skills with patients, laboratory personnel, other health care professionals, and with the public.</p>
<p>PO4: Cardiovascular Technology Knowledge Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional cardiovascular practice.</p>
<p>PO5: Cardiovascular Technology Ethics</p>

Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability values, communication and lifestyles. Perform within the guidelines of the code of ethics established by state and local regulatory groups. Use ethical frame works, apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO6: Environment and sustainability

Understand the impact of the professional cardiovascular technology solutions in environmental contexts and demonstrate the knowledge of need for sustainable development.

PO7: Life-long learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis upgrading skills in cardiovascular technology.

Curriculum

Semester 1									
Sl. No.	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCVT1001	General Anatomy-I	3	0	0	3	10	20	70
2	BCVT1002	General Physiology-I	3	0	0	3	10	20	70
3	BCVT1003	Biochemistry-I	3	0	0	3	10	20	70
4	FENG1001	Functional English-I	3	0	0	3	10	20	70
5	ENVS1001	Energy & Environmental Science	3	0	0	3	10	20	70
6	BCVT1051	General Anatomy-I (Practical)	0	0	2	1	10	20	70
7	BCVT1052	General Physiology-I (Practical)	0	0	2	1	10	20	70
8	BCVT1053	Biochemistry-I (Practical)	0	0	2	1	10	20	70
9	FENG1002	Functional English-I (Practical)	0	0	2	1	10	20	70
10	BBSUCT1002	Ethics and Professional Competency	1	0	0	1	10	20	70
11	BCSUCT1002	Disruptive Technologies	0	0	4	2	10	20	70
		Total				22			

Semester II									
Sl. No.	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCVT2001	General Anatomy-II	3	0	0	3	10	20	70
2	BCVT2002	General Physiology-II	3	0	0	3	10	20	70
3	BCVT2003	Cardiac Pharmacology and Clinical Treatment	3	0	0	3	10	20	70
4	BCVT2004	Cardiopathophysiology -I	3	0	0	3	10	20	70
5	FENG1003	Functional English-II	3	0	0	3	10	20	70
6	BCVT2051	Cardiac Pharmacology and Clinical Treatment (Lab)	0	0	2	1	10	20	70
7	FENG1004	Lab Functional English II (Lab)	0	0	2	1	10	20	70
8	BLEUCT1001	Foreign Language	2	0	0	2	10	20	70
9	BCEUCT1002	Disaster Management	2	0	2	3	10	20	70
		Total				22			

Semester III									
Sl. No.	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCVT3001	Cardio Pathophysiology-II	3	0	0	3	10	20	70
2	BCVT3002	Microbiology	3	0	0	3	10	20	70
3	BCVT3003	Medical Electronics, biophysics and computer usage relevant to Cardiac Technology-I	3	0	0	3	10	20	70
4	BCVT3004	Basic Electrocardiography-I	3	0	0	3	10	20	70
5	COMP1111	Computer Fundamentals	3	0	0	3	10	20	70
6	BCVT3051	Microbiology (P)	0	0	2	1	10	20	70
7	BCVT3052	Medical Electronics, biophysics and computer usage relevant to Cardiac Technology-I (P)	0	0	2	1	10	20	70
8	BCVT3053	Basic Electrocardiography-I (P)	0	0	2	1	10	20	70
9	COMP1112	Computer Fundamentals (P)	0	0	2	1	10	20	70
10	BCVT3006	CPR/Cardiac Emergency-I	2	0	0	2	10	20	70
11	BLEUCT100 2	Creative / Liberal Arts	0	0	1	0.5	10	20	70
12	BLLUCT100 4	Aptitude building and Logical Reasoning-1	0	0	2	1	10	20	70
		Total				22.5			

Semester IV									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCVT4001	Medical Electronics, biophysics and computer usage relevant to Cardiac Technology-II	3	0	0	3	10	20	70
2	BCVT4002	Basic Electrocardiography-II	3	0	0	3	10	20	70
3	BCVT4003	Advanced Electrocardiography-I	3	0	0	3	10	20	70
4	BCVT4051	Medical Electronics, biophysics and computer usage relevant to Cardiac Technology-II (P)	0	0	2	1	10	20	70
5	BCVT4052	Basic Electrocardiography-II (P)	0	0	2	1	10	20	70
6	BCVT4005	CPR/Cardiac Emergency-II	2	0	0	2	10	20	70
7	BCSUCT1001	AI and its application	0	0	4	2	10	20	70
8	BLEUCT1003	Creativity, Innovation and Entrepreneurship & IPR	1	0	0	1	10	20	70
9	BLLUCT2001	Aptitude building and Logical Reasoning-3	0	0	2	1	10	20	70
		Total				17			

Semester V									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1.	BCVT5001	Treadmill exercise stress testing and 24 hour recording	3	0	0	3	10	20	70
2.	BCVT5002	Echocardiography	3	0	0	3	10	20	70
3.	BCVT5003	Advanced Electrocardiography-II	3	0	0	3	10	20	70
4.	LLLL1001	Universal Human Value and Ethics	3	0	0	3	10	20	70
5.	BCCT5004	Cardiac Care Technician-I	6	0	0	6	10	20	70
6.	BCVT5051	Treadmill exercise stress testing and 24 hour recording (P)	0	0	2	1	10	20	70
7.	BCVT5052	Echocardiography (P)	0	0	2	1	10	20	70
8.	BCCT5053	Cardiac Care Technician-I (P)	0	0	4	2	10	20	70
ELECTIVES(Theory)									
9.	BCVT5005	Ultrasonography	2	0	0	2	10	20	70
10.	BCVT5006	Doppler							
		Total				24			

Semester VI									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BCVT6001	Cardiac catheterization laboratory basics	3	0	0	3	10	20	70
2	BCVT6002	Cardiac catheterization laboratory advanced	3	0	0	3	10	20	70
3	BCVT6003	Research Methodology and Biostatistics	3	0	0	3	10	20	70
4	BCCT6004	Cardiac Care Technician-II	6	0	0	6	10	20	70
5	BCVT6051	Cardiac catheterization laboratory basics (P)	0	0	2	1	10	20	70
6	BCVT6052	Cardiac catheterization laboratory advanced (P)	0	0	2	1	10	20	70
7	BCCT6053	Cardiac Care Technician-II (P)	0	0	4	2	10	20	70
		Project (any one)							
8	BCVT6053	Cardiology (Project)	0	0	2	1	10	20	70
	BCVT6054	ECG (Project)							
	BCVT6055	Stress testing (Project)							
	BCVT6056	Cardiac Output (Project)							
9	BLLUCT1003	Campus to Corporate	3	0	0	3	10	20	70
		Total				23			

Detailed Syllabus

Name of The Course	General anatomy-I			
Course Code	BCVT1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

- <https://www.dummies.com>
- <https://www.healthdirect.gov.au>

Course Objectives:

To understand the basic human anatomy and its functions.

Course Outcomes

CO1	To understand, analyze and illustrate the human body as a whole	Unit-1	8 hours
CO2	To understand, analyze the locomotor system and differentiate the various parts of the same.	Unit-2	8 hours
CO3	The student will be able to understand, analyze and illustrate the heart and the vascular system.	Locomotion and Support	
CO4	The student will be able to analyze and illustrate the gastro-intestinal tract.	Cartilage – types with example	& histology, Bone –
CO5	The student will be able to analyze and illustrate the respiratory system in detail.	Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of bones,	
CO6	The student will be able to improve and maximize the knowledge of recent advancement in anatomy	vertebral column, inter vertebral disc, fontanelles of fetal skull, Joints – Classification of joints with examples, synovial joint (in detail for radiology),	
		Muscular system- Classification of muscular tissue & histology, Names of muscles of the body.	

Text Book (s)

- B.D Chaurasia's, A Text Book of Anatomy
- William Davis, Understanding Human Anatomy and Physiology, McGraw Hill
- Ranganathan, T.S., A Text Book of Human Anatomy
- Snell's Clinical anatomy

Reference Book (s)

- Gray's Anatomy for Students by Drake
- Atlas der Anatomie des Menschen
- Book by Frank H. Netter

Reference websites:

- <https://www.ncbi.nlm.nih.gov>
- <https://www.sciencedirect.com>
- <https://theodora.com>

Unit-1	8 hours
Introduction: Human body as a whole	
Definition of anatomy and its divisions, Terms of location, positions and planes, Cell and its organelles, Epithelium-definition, classification, describe with examples, function, Glands classification, describe serous & mucous glands with examples, Basic tissues – classification with examples.	
Unit-2	8 hours
body as a whole	
Locomotion and Support	
Cartilage – types with example & histology, Bone –	
Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of bones,	
the gastro-intestinal tract.	
vertebral column, inter vertebral disc, fontanelles of fetal skull, Joints – Classification of joints with examples, synovial joint (in detail for radiology),	
Muscular system- Classification of muscular tissue & histology, Names of muscles of the body.	
Unit-3	8 hours
Cardiovascular System	
Heart-size, location, chambers, exterior & interior, Blood supply of heart, Systemic & pulmonary circulation, Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial, artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse, Inferior venacava, portal vein	

Unit-4	8 hours
Gastro-intestinal System	
Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, Radiographs of abdomen.	
Unit-5	8 hours
Respiratory System	
Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments, Histology of trachea, lung and pleura, Names of paranasal air sinuses.	
Unit 6: Recent advancement	8 hours
Respiratory epithelium, surface anatomy of thorax, surface anatomy of back	

Course outcome

On completion of this course, the students will be able to understand-scope and importance of cell, physiological laws, blood groups, blood transfusion and fundamentals of different organ systems.

CO1	To understand, illustrate the cell, its functions with mitosis and meiosis
CO2	To understand and illustrate the importance of physiochemical laws applied to physiology like osmosis, diffusion.
CO3	To understand, and illustrate the composition of blood and its components and analyze the importance of each component of blood.
CO4	To understand and analyze the physiology of heart and the circulation system
CO5	To understand and analyze the functioning of the respiratory and excretory system
CO6	To develop understanding of the recent advances in physiology of cell and transport across it.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	General physiology-I			
Course Code	BCVT1002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The basic objective of this course is to get familiar with human physiology.

Text Books

- Essentials of Medical Physiology, Book by K. Sembulingam and Prema Sembulingam
- Guyton & Hall Textbook of Medical Physiology, by John E. Hall (Author), Mario Vaz (Author), Anura Kurpad (Author), Tony Raj (Author)
- Medical Physiology by Boron (Author), Walter (Author)

Reference Books

- Ganong's Review of Medical Physiology
- Berne & Levy Principles of Physiology
- Medical Physiology, International Edition Paperback – 18 May 2016 by Boron (Author), Walter (Author)

Unit-1	8 hours
Cell Definition, Structure and function of Cytoplasmic Organelles, Reproduction- Meiosis,	

Mitosis	
Unit-2 The important physio-chemical laws applied to physiology Diffusion, Osmosis, Bonding, Filtration, Dialysis, Surface Tension, Adsorption, Colloid.	8 hours
Unit-3 Introduction- composition and function of blood Red blood cells- Erythropoiesis, stages of differentiation function, counts physiological Variation. Haemoglobin -Structure, function, concentration physiological variation. methods of estimation of Hb, White blood cell- Production, function, life span, count, differential count. Platelets- Origin, normal count, morphology functions. Plasma Proteins- Production, concentration, types, albumin, globulin, fibrinogen, Prothrombin functions. Haemostasis & Blood coagulation. Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting disorders of clotting factors. Blood Bank, Blood groups-A, B, O system, Rh system.	8 hours
Unit-4 Circulation: General principles Heart: myocardium – innervation – transmission of cardiac impulse Events during cardiac cycle – cardiac output. Peripheral circulation: peripheral resistances – arterial blood pressure – measurements – factors regulation variations – capillary circulation – venous circulation. Special circulation: coronary cerebral – miscellaneous.	8 hours
Unit-5 Mechanics of respiration – pulmonary function tests – transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea – asphyxia.: Body fluids – distribution, measurement & exchange, Kidney – structure of nephron – mechanism of urine formation – composition of the urine and abnormal constituents – urinary Bladder & micturition.	8 hours
Unit-6 Recent advances in physiological studies on cell, cell membrane and transport across the cell membrane.	8 hours

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks			
10	20	70	100			
Name of The Course		Biochemistry-I				
Course Code		BCVT1003				
Prerequisite						
Corequisite						
Antirequisite						
			L	T	P	C
			3	0	0	3

Course Objectives:

To understand the basic biochemistry.

Course outcome

On completion of this course, the students will be able

CO1	To analyze and interpret carbohydrate metabolism
CO2	To analyze and interpret protein metabolism
CO3	To analyze and interpret lipid metabolism
CO4	To analyze and interpret vitamins
CO5	To analyze and interpret minerals
CO6	To understand recent advances in glucose transport, lipid and cholesterol metabolism in cell.

Text Books

- Biochemistry U. Satyanarayana, U. Chakrapani
- Lippincott's Illustrated Reviews: Biochemistry
- Das, Debajyothi, Biochemistry, Academic, Publishers, Calcutta.

4. Kaplan, Clinical Chemistry

Reference Books

1. Harper's Illustrated Biochemistry by Robert K. Murray, Darryl K. Granner, Peter A. Mayes
2. Lippincott's Illustrated Reviews: Biochemistry
3. Varley, Clinical Chemistry.
4. Kaplan, Clinical Chemistry

Unit-1	8 hours	Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function).
Unit-2	8 hours	Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen).
Unit-3	8 hours	Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen).
Unit-4	8 hours	Vitamins: General with emphasis on A, B2, C, E and inositol (requirements, assimilation and properties)
Unit-5	8 hours	Minerals: Na, K, Ca, P, Fe, Cu and Se (requirements, availability and properties.
Unit 6	8 hours	Recent advances in cell metabolism: The development in studies over GLUT glucose transport across the cell membrane. Lipid and cholesterol metabolism studies.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The	Functional English I
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Course	
Course Code	FENG1001
Prerequisite	
Corequisite	
Antirequisite	
	L T P C
	3 0 0 3

Course Objectives:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course outcome

On the successful completion of the course, the student would be able to:

CO1	Develop the understanding into the communication and language as its medium
CO2	Develop the basic understanding of spoken English
CO3	Improve their reading fluency skills through extensive reading
CO4	Use and assess information from academic sources, distinguishing between main ideas and details
CO5	Compare and use a range official support through formal and informal writings

Text Books & Reference Books

Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)

**English Language for Competitive Examinations
By Prof. Aysha Iqbal (NPTEL)**

**Better Spoken English by Prof. Shreesh
Chaudhary, Department of Humanities and Social
Sciences, IIT Madras. (NPTEL)**

**Understanding Creativity and Creative Writing by
Prof. Neelima Talwar(NPTEL)**

Unit-1 Hours
<ul style="list-style-type: none"> • Communication: Definition, Types (Verbal and Non-verbal), Models, Language as a tool of communication • The flow of Communication, Communication Networks • Barriers to Communication • Professional Communication • Features of professional communication
Importance of Business/Technical Communication
Unit-2 Hours
<ul style="list-style-type: none"> • Word Formation • Basic sentence structure • Common Errors: Subject- Verb agreement, prepositions, Articles, Place of adverb, Consistency of tenses, • Paragraph Writing: Methods, unity and coherence
Reading Skills: Types, Strategies, Barriers,
Unit-3 Hours
<ul style="list-style-type: none"> • Official Communication: Letter, Memo, Agenda and Minutes of meeting, notice and circular, and email
Job Application,

Continuous Assessment Pattern

Internal Assessment	Mid Term Test	End Term	Total Marks
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(IA)	(MTE)	Test (ETE)	
10	20	70	100

Name of The Course	Energy and Environmental Sciences			
Course Code	ENVS1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To develop awareness about our environment.
2. To develop a concern about sustainable development.

Course Outcomes

CO1	Understand About environment and its components and Problems associated with natural resources and their sustainable use.
CO2	Chemical Toxicity of the chemicals in the environment and Sources of pollution in air , water and soil and Solid waste management and natural Disaster management.
CO3	Understanding about social issues.
CO4	Understanding of role of information technology to address environmental issues.
CO5	Application of sustained Chemistry.

Text Book (s):

1. **Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008,**
2. **Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons .**
3. **Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005**

Reference Book (s):

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008,

2. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons .

3. Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005.

Unit-1 hours	8
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources – Use and exploitation, environmental effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.	
Unit-2 8 Hours	
Chemical Toxicology Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides.	
Unit-3 8 hours	
Environmental Pollution	

Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit-4
8 hours

Social Issues, Human Population and the Environment

Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.

Unit-5
8 hours

Green Chemistry

Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks

10	20	70	100
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Name of The Course	General Anatomy-I (P)			
Course Code	BCVT1051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: To understand the basic human anatomy and its functions.

Course Outcomes

CO1	To understand the anatomy of different body systems.
CO2	To understand the functions exhibited by the systems in our body.
CO3	To understand the interrelationships among molecular, cellular, tissue and organ functions in each system.
CO4	To understand contributions of organs and systems to the human body.
CO5	To understand about the modern technology and tools used to study anatomy and physiology.

Text Book (s):

- William Davis, Understanding Human Anatomy and Physiology, McGraw Hill.
- Chaurasia's, Practical of Human Anatomy.

Reference Book (s):

- Grey's Anatomy.

Unit-1 Introduction
The anatomy of different body systems.
Unit-2
The histology of different body systems.
Unit-3
The skeletal system.
Unit-4
The organ systems.
Unit-5

Modern technology and tools used to study anatomy and physiology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	General Physiology-II (P)			
Course Code	BCVT1052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: To understand the basic human physiology practicals.

Course Outcomes:

CO1	To analyze and estimate haemoglobin levels and total WBC.
CO2	To analyze and estimate red blood cell counts and identify blood groups.
CO3	To analyze and interpret differential WBC counts and PCV
CO4	To analyze ESR and blood indices.
CO5	Estimating and analyzing bleeding count, clotting time and blood pressure.

Text Book (s):

- A.K Jain, Practical Handbook of Human Physiology.

Reference Book (s):

- Guyton and Hall Text Book of Physiology.

Unit-1 Introduction
Haemoglobinometry, White Blood Cell Count, Red Blood Count.
Unit-2

Determination of Blood Groups, Leishman's staining and Differential WBC count, Determination of packed cell Volume. Erythrocyte sedimentation rate [ESR].
Unit-3
Calculation of blood indices, Determination of Clotting Time, Bleeding Time. Blood pressure Recording.
Unit-4
Auscultation for Heart Sounds, Artificial Respiration, Determination of vital capacity.
Unit-5
Spirometry to measure various lung capacities & volumes, Respiratory rate, tidal volume, VC, timed VC, IRV, IC, ERV, EC on Spirometry (demonstration only), auscultation and percussion.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Basic Biochemistry-I (P)			
Course Code	BCVT1053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: The basic objective of this course is to get familiar with Medical Biochemistry practicals.

Course Outcomes

CO1	To understand analysis of normal urine and liver function test.
CO2	To understand and interpret renal function test and lipid profile.
CO3	To analyze and interpret, blood gases and electrolytes.
CO4	To interpret glucose levels with the glucometer and strips.
CO5	Estimating and analyzing special proteins and carbohydrates.

Text Book (s):

- Biochemistry U. Satyanarayana, U. Chakrapani.
- Lippincott's Illustrated Reviews: Biochemistry

Reference Book (s):

- Harper's Illustrated Biochemistry, by Robert K. Murray, Darryl K. Granner, Peter A. Mayes
- Lippincott's Illustrated Reviews: Biochemistry

Unit-1 Introduction
Analysis of Normal Urine, Liver Function tests.
Unit-2
Lipid Profile. Renal Function test.
Unit-3
Blood gas and Electrolytes, Demonstration of Glucometer with strips.
Unit-4
Reactions of monosaccharides, disaccharides and starch, Glucose, Fructose, Galactose, Maltose, lactose, Sucrose
Unit-5
Starch Analysis of Unknown Sugars, Estimation: Photometry Biofluid of choice – blood, plasma, serum Standard graphs, Glucose, Proteins, Urea, Creatinine, Bilirubin.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Lab Functional English-I			
Course Code	FENG1002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course outcome

On the successful completion of the course, the student would be able to:

CO1	Develop the understanding into the communication and language as its medium
CO2	Develop the basic understanding of spoken English
CO3	Improve their reading fluency skills through extensive reading
CO4	Use and assess information from academic sources, distinguishing between main ideas and details

CO5	Compare and use a range official support through formal and informal writings
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Text Books & Reference Books

Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)

English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)

Better Spoken English by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)

Understanding Creativity and Creative Writing by Prof. Neelima Talwar (NPTEL)

Course content:

The following activities will be conducted in lab classes:

- Introduction
- Extempore
- Movie Review
- Phonetics (Sounds)
- Phonetics (Transcription)
- Practice on Clear Pronunciation
- Practice on Tense Buster
- Role Play
- Group Discussion
- Group Presentation by Students

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	General anatomy-II			
Course Code	BCVT2001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: To understand the basic human anatomy and its functions.

Course Outcomes

CO1	Students will be able to interpret the anatomy of the urinary system.
CO2	Students will be able to interpret the action of antianginal drugs on a patient with angina.
CO3	Students will be able to interpret anatomy and functioning of the central nervous system.
CO4	Students will be able to interpret the basic anatomy and functioning of the reproductive system.
CO5	Students will be able to interpret the anatomy and functioning of the various sensory systems.
CO6	To develop an understanding regarding surface anatomy of body

Text Book (s):

1. William Davis, Understanding Human Anatomy and Physiology, McGraw Hill.
2. B D Chaurasia's, A Text Book of Anatomy.
3. Ranganathan, T.S., A Text Book of Human Anatomy.

Reference Book (s):

1. Fattana, Human Anatomy, (Description and Applied), Saunder's & C P Prism Publishers, Bangalore.
2. Ester. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippincott. Philadelphia
3. Grey's Text Book of Anatomy

Unit-1 Introduction 8 hours
Urinary System Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder.
Unit-2 8 Hours
Endocrine Glands Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal gland (gross & histology).
Unit-3 8 Hours
Nervous System Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Cranial nerves, Sympathetic trunk & names of parasympathetic ganglia.
Unit-4 8 Hours
Reproductive System Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology), Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology), Mammary gland-gross.
Unit-5 8 Hours
Sensory Organs Skin: Skin-histology, Appendages of skin, Eye: Parts of eye & lacrimal apparatus, Extra-ocular Muscles & nerve supply, Ear: parts of ear-external, middle and inner ear and contents.
Unit 6: 8 Hours
Surface anatomy Upper extremity, lower extremity and abdomen

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	General Physiology-II			
Course Code	BCVT2002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: The basic objective of this course is to get familiar with human physiology.

Course Outcomes

CO1	Students will be able to interpret the workings of individual human cell and the impact of the environment on the human body.
CO2	Students will be able to interpret the functioning of the central nervous system.
CO3	Students will be able to interpret the functioning of gastrointestinal system.
CO4	Students will be able to interpret the basic functioning of the endocrine system and its hormones.
CO5	Students will be able to interpret the functioning of the lymphatic and reproductive systems.
CO6	Students will be able to develop an understanding of recent advances in physiological system of human body

Text Book (s):

1. Essentials of Medical Physiology, Book by K. Sembulingam and Prema Sembulingam.
2. Guyton & Hall Textbook of Medical Physiology, by John E. Hall (Author), Mario Vaz (Author), Anura Kurpad (Author), Tony Raj (Author)

Reference Book (s):

1. Ganong's Review of Medical Physiology, Book by Heddwen Brooks, Kim E. Barrett, Scott Boitano, and Susan M. Barman.
2. Berne & Levy Principles of Physiology, Textbook by Bruce A Stanton, Bruce M Koeppen, and Matthew N. Levy

8 hours
General principles of cell physiology, Physiology of skeletal muscle. Environmental Physiology Body temperature regulation (including skin Physiology).
Unit-2
8 hours
Nervous System
Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Blood supply of brain, Cranial nerves, Sympathetic trunk & names of parasympathetic ganglia.
Unit-3
8 Hours
Digestion: General arrangement, Salivary digestion – functions & regulations Gastric digestion – functions & regulations Pancreatic digestion – functions & regulations Intestinal digestion – functions & regulations Liver & bile Absorption Motility Deglutition Vomiting Defecation Functions of large intestine Neurohumoral regulations of alimentary functions, summary.
Unit-4
8Hours
Endocrines: Hormone mechanism – negative feed backs – tropic action – permissive action – cellular action, hypothalamic regulation Thyroid - hormones, actions, regulations Adrenal cortex - hormones, actions, regulations Adrenal medulla – hormones, actions, regulations Parathyroid - hormones, actions, regulations Islets of pancreas –

Unit-1 Introduction

hormones, actions, regulations Miscellaneous
hormones, actions, regulations Common clinical disorders.
Unit-5 8 Hours
Fundamentals of different Organ Systems
i. Lymphatic System
ii. Reproductive System
Unit-6 8 Hours
Recent advances in the functioning of human body organs.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardiac Pharmacology and Clinical Treatment			
Course Code	BCVT2003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: To understand the Cardiac Pharmacology and Clinical Treatment.

Course Outcomes

CO1	Students will be able to interpret the mechanism of action of drugs on the body and its adverse reactions.
CO2	Students will be able to interpret the action of antianginal drugs on a patient with angina.
CO3	Students will be able to interpret and understand drugs for treating cardiac failure.
CO4	Students will be able to interpret the actions of antihypertensives and antiarrhythmic agents.

CO5	Students will be able to interpret the actions of antithrombotic agents, lipid-lowering agents, and anti-sclerotic drugs.
CO6	Student will be able to develop relevance and need of recent trends in pharmacotherapy of cardiovascular diseases.

Text Book (s):

1. Tripathi K.D., Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.
2. Rang M.P., Dale M.M., Ritter J.M., Pharmacology, Churchill Livingstone.
3. Katzung, B.G., Basic & Clinical Pharmacology, Prentice Hall, International.
4. Barar F.S.K., Text Book of Pharmacology, Interprint, New Delhi.

Reference Book (s):

1. Laurence D.R. & Bannet P.N., Clinical Pharmacology, Churchill Livingstone.
2. Goodman & Gilman, The Pharmacological Basis of Therapeutics, Editors:-J.G Hardman, L.E. Limbird, P.B. Molinoss, R.W. Ruddon & A.G. Gil, Pergamon Press.
3. Pharmacology For Undergraduates, Agarwal S. L.
4. Pharmacology: Principles and Practice by Miles Hacker, William S. Messer, Kenneth A. Bachmann

Unit-1 Introduction

8 hours

General Pharmacology

Introduction to pharmacology, dosage forms & routes of administration, mechanism of action, concept of receptors, ADME, Adverse drug reactions.

Unit-2

8 Hours

Anti-anginal agents: Beta blockers- propranolol, atenolol, metoprolol, bisoprolol, carvedilol, esmolol; Nitrates-nitroglycerine, isosorbidedinitrate,

isosorbidemononitrate, transdermal nitrate patches; Calcium channel blockers- nifedipine, verapamil, dilteazem, Amlodipine.
Unit-3 8 Hours
Anti-failure agents: Diuretics-furosemide, torsamide, thiazide diuretics, metolazone, spironolactone, combination diuretics; Angiotensin converting enzyme (ACE) inhibitors – captopril Enalapril, ramipril, lisinopril, ACE inhibitors for diabetics and hypertensive renal disease; Digitalis and acute ionotropes– digoxin, doubutamine, dopamine, adrenaline, noradrenaline, isoprenaline.
Unit-4 8 Hours
Anti-hypertensive drugs: Diuretics, beta-blockers, ACE inhibitors, calcium antagonists, direct Vasodilators, centrally acting and peripherally acting vasodilators. Anti- arrhythmic agents: Amiodarone, adenosine, verapamil, diltiazem, lidocaine, mexiletine, Phenytoin, flecainide, bretylium, atropine.
Unit-5 8 Hours
Antithrombotic agents: Platelet inhibitors: aspirin, clopidogrel; Anticoagulants: heparin, low molecular weight heparin, warfarin; Fibrinolytics: streptokinase, urokinase; Glycoprotein 2b3a antagonists: abciximab, tirofiban, eptifibatide. Lipid lowering and anti-atherosclerotic drugs: statins, exetimibe, niacin, fenofibrate.
Unit 6: 8 Hours
Advances/current trends in: Pharmacokinetics, Pharmacodynamics, anti anginal drugs, anti failure agents, anti hypertensive drugs, anti arrhythmic drugs, anti thrombotic drugs, lipid lowering drugs.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardio Pathophysiology-I			
Course Code	BCVT2004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: The basic objective of this course is to get familiar with pathophysiology of human system.

Course Outcomes

CO1	The students will be able to understand, analyze and interpret various diseases of the heart valves.
CO2	The students will be able to understand, analyze and interpret essential and secondary hypertension.
CO3	The students will be able to understand, analyze and interpret coronary artery disease.
CO4	The students will be able to understand, analyze and interpret heart failure and its treatment.
CO5	The students will be able to understand, analyze and interpret various disease affecting the myocardium.
CO6	To develop an understanding regarding occupational lung diseases

Text Book (s):

1. Robbins and Cotran Pathologic Basis of Disease, Textbook by Stanley L Robbins.
2. Textbook of Pathology, Book by Harsh Mohan.
3. A Textbook of Pathology, Nicholas Vardaxis.

Reference Book (s):

1. Essential Pathology, Third Edition Rubin and Farber's Pathology.
2. Essentials of Rubin's Pathology. Emanuel Rubin, Howard M. Reisner.
3. Oxford Textbook of Pathology: General Principles of Pathology.

Unit-1 Introduction 8 hours
Valvular heart disease: Etiology, Acquired valvular heart disease, Rheumatic fever and rheumatic heart disease, Aortic stenosis, Aortic regurgitation, Mitral valve disease, Mitral stenosis, Mitral regulation, Tricuspid valve disease, Infective endocarditis, Valvuloplasty and valve surgery.
Unit-2 8 hours
Systemic hypertension: Essential and secondary hypertension.
Unit-3 8 hours
Coronary artery disease: Pathophysiology and clinical recognition, Angina Pectoris, Symptomatic and asymptomatic myocardial ischemia, Types and locations of myocardial infarction, Thrombolytic therapy, Medical treatment, Percutaneous interventions, Surgical treatment, Cardiac rehabilitation.
Unit-4 8 hours
Heart failure: Surgical and medical treatment.
Unit-5
Myocardial diseases: Dilated cardiomyopathy, Hypertrophic cardiomyopathy, Myocarditis, Restrictive cardiomyopathy.
Unit 6: 8 Hours
Occupational lung disease: Silicosis, Pneumoconiosis, Asbestosis

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Functional English II
Course Code	FENG1003

Prerequisite	
Corequisite	
Antirequisite	
	L T P C
	3 0 0 3

Course Objectives:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course outcome:

On the successful completion of the course, the student would be able to:

CO1	Develop the understanding into the communication and language as its medium
CO2	Develop the basic understanding of spoken English
CO3	Improve their reading fluency skills through extensive reading
CO4	Use and assess information from academic sources, distinguishing between main ideas and details
CO5	Compare and use a range official support through formal and informal writings

Text Books & Reference Books

Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)

English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)

Better Spoken English by Prof. Shreesh

Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)

Understanding Creativity and Creative Writing by Prof. Neelima Talwar(NPTEL)

Unit-1 <ul style="list-style-type: none"> • Technical Writing: Meaning, Types, Style, Features • Report: Types, Format, Structure, Citation, Planning and writing, Project report Manual and user guide: general layout, planning and writing
Unit-2 <ul style="list-style-type: none"> • Proposal: Types, format, structure, planning and writing • Listening vs Hearing, Steps and Types of listening; Barriers of Listening, Methods to improve listening Group Discussion
Unit-3 : <ul style="list-style-type: none"> • Spelling and Phonetic Inconsistencies in English • Basics of Pronunciation, Organs of speech, articulation, Introduction to Sounds (IPA) • Phonetic/Phonemic Transcription Presentation Strategies: Purpose, Audience and locale analysis, Non-verbal aspects, voice and pronunciation, effective PowerPoint preparation

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardiac Pharmacology and Clinical Treatment (P)
Course Code	BCVT2051
Prerequisite	
Corequisite	

Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives: The basic objective of this course is to get familiar with the experiments of pharmacology.

Course Outcomes:

CO1	To identify different animals used in the Pharmacology lab.
CO2	To demonstrate and understand different routes of administration of drugs in mice/rats.
CO3	To demonstrate and prepare different Physiological Salt solution.
CO4	To study the different instruments used in Pharmacology lab.
CO5	To study the different techniques used in Pharmacology lab.

Text Book (s):

1. Tripathi K.D., Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.
2. Rang M.P., Date M.M., Ritter J.M., Pharmacology, Churchill Livingstone.

Reference Book (s):

1. Katzung, B.G., Basic & Clinical Pharmacology, Prentice Hall, International.
2. Satoskar&Bhandarkar, Pharmacology &Pharmacotherapeutics, Popular Prakashan Pvt. Ltd. Bombay.

Unit-1 Introduction
Different routes of different drug administraton.
Unit-2
Preparation of different physiological solution.
Unit-3
Study of different animals in pharmacology lab.
Unit-4
Instruments used in pharmacology lab
Unit-5
Techniques used in pharmacology lab

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Lab Functional English-II			
Course Code	FENG1004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course outcome

On the successful completion of the course, the student would be able to:

CO1	Develop the understanding into the communication and language as its medium
CO2	Develop the basic understanding of spoken English
CO3	Improve their reading fluency skills through extensive reading
CO4	Use and assess information from academic sources, distinguishing between main ideas and details

CO5	Compare and use a range official support through formal and informal writings
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Text Books & Reference Books

Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)

English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)

Better Spoken English by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)

Understanding Creativity and Creative Writing by Prof. Neelima Talwar (NPTEL)

Course content:

The following activities will be conducted in lab classes:

- Spin-a-yarn
- Drafting Catchphrases
- Picture Interpretation (Denotation and Connotation)
- Active Listening
- Reading between the lines
- Brief Biography of Female Personalities
- Rhythm and Intonation
- Public Speaking
- Mock Lecture
- Dialogue Writing
- Enacting scene(s) from critically appreciated movies

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardio Pathophysiology-II			
Course Code	BCVT3001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

1. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.

2. Dipiro JL, Pharmacotherapy–A Pathophysiological Approach, Elsevier.

3. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company

Reference websites:

1. <https://dx.doi.org/10.1155/2015/138148>
2. <https://www.medicalnewstoday.com>
3. <https://www.who.int>
4. <https://www.ncbi.nlm.nih.gov>

Course Objectives: **The basic objective of this course is to get familiar with pathophysiology of human system.**

Course Outcomes

CO1	To analyze and interpret pericardial diseases	Unit-1	8 hours
CO2	To analyze and interpret electrical disturbances of the heart	Pericardial Diseases: Pericardial effusion, Constrictive pericarditis, Cardiac tamponade	
CO3	To understand Pulmonary hypertension		
CO4	To analyze and interpret Peripheral Vascular Disease		
CO5	To analyze and interpret Congenital heart disease		
CO6	To improve and maximize the knowledge of recent advancement in disease and its treatment	Unit-2	8 hours

Electrical disturbances of the heart: **Sinus node dysfunction, Arrhythmias and conduction Disturbances, Treatment of arrhythmias, pharmacological, radiofrequency ablation and surgery**

Unit-3 **8 hours**
Pulmonary hypertension: **Primary pulmonary hypertension, Pulmonary thrombo-embolism**

Unit-4 **8 hours**
Peripheral Vascular Disease: **Atherosclerotic peripheral vascular disease, Aortic aneurysms, Aortic dissection, Takayasu arteritis**

Unit-5 **8 hours**
Congenital heart disease:
(a) **Acyanotic heart disease, Atrial septal defect, Ventricular septal defect, Patent ductus arteriosus, Congenital valvular disease, Coarctation of aorta**
(b) **Cyanotic congenital heart disease, Tetralogy of**

Text Book (s):

1. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.

2. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.

3. ShalyaSubhash, Human Physiology, CBS Publishers & Distributors.

4. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.

5. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.

6. Tortora GJ, & Anagnostoukos NP, Principles of Anatomy & Physiology, Harper & Rave Publishers, New Delhi.

Reference Book (s):

Fallot, Double outlet right ventricle, Pulmonary atresia, Transposition of great arteries, Truncus arteriosus, Total anomalous pulmonary venous connection

Unit 6: 8 hours

Recent advancement: Coronavirus, COPD, Recent advancement on pathophysiology, diagnostic and therapeutic insights in cardiac dysfunction induced by antineoplastic drug

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Microbiology			
Course Code	BCVT3002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: **To get familiar with microbiology.**

Course Outcomes

CO1	To understand, analyze and interpret microorganisms and their characteristics with reference to bacteria.
CO2	To understand, analyze and interpret viruses and their characteristics
CO3	To understand and interpret techniques of sterilization
CO4	To understand, analyze and interpret fungi and parasites.

CO5	To understand and analyze different methods of cultivation and in identification of microbes.
CO6	To develop an understanding of recent advances in Covid_19

Text Book (s):

- Aneja K.R. Experiments in Microbiology, Plant Pathology, Tissue Culture & Mushroom Cultivation, VishwaPrakashan.**
- Gunasekaran P, Lab Manual of Microbiology, New Age Publishers**
- Davis, Dulbetco, Eisen Microbiology.**
- Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R. General Microbiology, Macmillan Press Limited.**
- Hugo and Russell, Pharmaceutical Microbiology, Black Well Scientific Publication, Oxford.**
- Prescott L.M., Harley J.P. & Klien D.A. Microbiology, McGraw Hill.**
- Sykes, Disinfection and Sterilization.**

Reference Book (s):

- Pelczar & Reid, Microbiology, Tata McGraw Hill, Delhi.**
- Virella G. Microbiology and Infectious Diseases, William & Wilkins.**
- Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longman**

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Medical electronics, biophysics and computer usage relevant to cardiac technology-I
Course Code	BCVT3003
Prerequisite	
Corequisite	
Antirequisite	
	I T P C
	3 0 0 3

Course Objectives: **To get familiar with microbiology.**

Course Outcomes

To understand and analyze medical physics, and its uses in diagnostic imaging

To understand the concept of blood

<p>Unit-1 8 hours General characters and classification of Bacteria, Growth and Maintenance of Microbes Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO₂ requirement, temperature, pH, light Characteristics of Bacteria Morphology - Shape, Capsule, Flagella, Inclusion, Granule, Spore. Bacteria affecting the heart.</p>	
<p>Unit-2 8 hours Virus General Characteristics of viruses, Cultivation, Nomenclature of viruses, Interaction –virus-host, Bacteriophage, Viruses affecting the heart-adenovirus, CMV, coxsackievirus B, Enteric cytopathic human orphan viruses (ECHO), Human Parvo virus B19, Rubella</p>	
<p>Unit-3 8 hours Sterilization and Disinfection. Physical agents- Sunlight, Temperature less than 1000C, Temperature at 1000C, steam at atmospheric pressure and steam under pressure, irradiation, filtration Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide</p>	
<p>Unit-4 8 hours Mycology & Parasitology: Mycology: Introduction, classification, Fungus affecting the heart- Candida and Histoplasma capsulatum, Aspergillus sp., Diagnosis. Parasitology: Introduction, classification, Diagnosis. Its role in heart disease- trypanosome, toxoplasma, trichura, Chaga's disease, echinococcus, amoebiasis.</p>	5
<p>Unit 8 hours Staining Methods & Culture media Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media Simple, Grams staining, Ziehl-Neelsen staining or AFB staining, Negative Impregnation</p>	6
<p>Unit 8 hours Covid_19: Recent advances on the Coronavirus, Characteristics, virus-host interactions, mode of transmission and possible treatments.</p>	

pressure and pressure transducers
To understand and interpret the concept of defibrillators, cathode ray tubes
To understand and interpret the concept of Impedance plethysmography
To understand and interpret the concept of pulse oximetry
To understand the latest techniques HRCT (high resolution chest ct)

Text Book (s):

1. Dhanjoo N. Ghista Noninvasive Cardiac assessment technology.
2. Alberto Benchimol - Non-invasive diagnostic techniques in cardiology Williams & Wilkins, 1981
3. Atul Luthra ECG Made Easy JP Medical Ltd, 2012.

4. PRINCIPLE & TECHNIQUES OF BIOPHYSICS BY N ARUMUGAM.

5. CARDIAC PACING & DEFIBRILLATION BY HAYES, DAVID

6. THE BLOOD PRESSURE BY CLVRISTIAN GOODMAN

Reference Book (s):

1. Malcolm S. Thaler The Only EKG Book You'll Ever Need, Volume 365 Lippincott Williams & Wilkins, 2009

Unit-1 Introduction to medical physics	
Unit-2 8 hours Blood pressure recording, Pressure transducers	
Unit-3 8 hours Defibrillators, Cathode ray tubes and physiological monitors	
Unit-4 8 hours Impedenceplethysmography	
Unit-5 8 hours Pulse oximetry	
Unit-6 8 hours HRCT CLINICAL INDICATIONS THORACIC ANATOMY TYPES OF CT IMAGING WINDOWS OF CT IMAGING FINDINGS OF HRCT	

Course Objectives: To get familiar with Basic Electrocardiography.

Course Outcomes

CO1	To understand various principles of electrocardiography
CO2	To understand and apply the principles of electrocardiography
CO3	To understand and interpret Electrocardiographic lead systems
CO4	To understand and interpret hex axial reference frame and electrical axis
CO5	To understand and record adult and paediatric ECGs
CO6	To understand the latest techniques in the ECG recordings

Text Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005

2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011

Reference Book (s):

1. Patrick Kay, Manel Sabate, Marco A. Costa Cardiac Catheterization and Percutaneous Interventions Taylor & Francis, 2004

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks			
10	20	70	100			
Name of The Course	Basic Electrocardiography-I					
Course Code	BCVT3004					
Prerequisite						
Corequisite						
Antirequisite						
			L	T	P	C
			3	0	0	3

Unit-1 8 hours Fundamental principles of electrocardiography: Cardiac electrical field generation during activation, Cardiac wave fronts
Unit-2 8 hours Cardiac electrical field generation during ventricular recovery
Unit-3 8 hours Electrocardiographic lead systems: Standard limb leads, Precordial leads and the Wisdom

Centralterminal, Augmented limb leads
Unit-4 8 hours The hexaxial reference frame and electrical axis
Unit-5 8 hours Recording adult and pediatric ECGs
Unit-6 8 hours Recent Advances in Remote ECG monitoring

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Computer fundamentals			
Course Code	COMP1111			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: **The basic objective of this course is to get familiar with computers and programming Language.**

Course Outcomes

CO1	
CO2	
CO3	
CO4	
CO5	

Text Book (s):

1. Computer Fundamentals, Anita Goel
2. Computer Fundamentals, Rashmi Sharma

3. Computer Fundamentals and Programming in C, Reema Thareja
4. Computer Fundamentals (Book + CD-Rom), PradeepK.Sinha&PritiSinha

Reference Book (s):

1. Computer Fundamentals, Dr. SushilaMadan
2. Computer Fundamentals and Information Technology, Ramesh Bangia

Unit-1
8 hours
Definition and Overview of Computer, Computer classification, Computer Organization, Computer code, computer classification of Boolean algebra. Input Devices Output devices, Storage devices. Computer Software, Types of software. Overview of Computer Networks, LAN, MAN, WAN, Internet, Intranet, network topology. Internetworking: Bridges, Repeaters and Routers

Unit-2
8 hours
Introduction: Operating system and function, Evolution of operating system, Batch, Interactive, Time sharing and Real Time System. Single User Operating System and Multi-user Operating system, Compare MS-DOS vs. UNIX, Various window features. Internal and External commands in MS-DOS

Unit-3
8 hours
Introduction to MS-OFFICE-2003, word 2003 Document creation, Editing, formatting table handling, mail merge, Excel-2003, Editing, working Retrieval, Important functions, short cut keys used in EXCEL

Unit-4
8 hours
MS-Power point 2003-Job Profile, Elements of Power point , ways of delivering Presentation, concept of Four P's (Planning , Preparation, Practice and Presentation) ways of handling presentations e.g. creating, saving slides show controls, Adding formatting, animation and multimedia effects.

Unit-5
8 hours
Computer applications in clinical studies.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Microbiology (P)			
Course Code	BCVT3051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: To familiar with practical aspects of microbiology.

Course Outcomes

CO1	To understand and demonstrate the preparation of swabs/sterile tubes & bottles.
CO2	To understand and demonstrate the preparation of smear.
CO3	To understand and demonstrate Staining: Gram & Ziehl-Neelsen staining
CO4	Identification of Culture media and instruments
CO5	Identification of common microbes.

Text Book (s):

1. Aneja K.R. Experiments in Microbiology, Plant Pathology, Tissue Culture & Mushroom Cultivation, VishwaPrakashan.
2. Gunasekaran P, Lab Manual of Microbiology, New Age Publishers.
3. Davis, Dulbetco, Eisen Microbiology.

4. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R. General Microbiology, Macmillan Press Limited.

5. Hugo and Russell, Pharmaceutical Microbiology, Black Well Scientific Publication, Oxford.

6. Prescott L.M., Harley J.P. & Klien D.A. Microbiology, McGraw Hill.

Reference Book (s):

1. Sykes, Disinfection and Sterilization.
2. Pelczar & Reid, Microbiology, Tata McGraw Hill, Delhi
3. Virella G. Microbiology and Infectious Diseases, William & Wilkins.
4. Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longman

Unit-1	1. Preparation of swabs/sterile tubes & bottles
Unit-2	2. Preparation of smear.
Unit-3	3. Staining: Gram & Ziehl-Neelsen staining.
Unit-4	4. Identification of Culture media.
Unit-5	5. Identification of instruments.

Continuous Assessment Pattern

Internal Assessment (IA)	MTE	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Medical electronics, biophysics and computer usage relevant to cardiac technology-I (P)				
Course Code	BCVT3052				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	0	0	2	1	

Course Objectives: **To get familiar with medical electronics, biophysics and computer usage relevant to cardiac technology.**

Course Outcomes

CO1	To understand, and interpret the usage BP monitoring devices.
CO2	To understand, and interpret the usage of Pressure transducers, Defibrillators, Cathode ray tubes
CO3	To understand, and interpret the usage plethysmography Pulse oximetry

Text Book (s):

- Dhanjoo N. Ghista Noninvasive Cardiac assessment technology**
- Alberto Benchimol - Non-invasive diagnostic techniques in cardiology Williams & Wilkins, 1981**
- Atul Luthra ECG Made Easy JP Medical Ltd, 2012**

Reference Book (s):

1Malcolm S. Thaler The Only EKG Book You'll Ever Need, Volume 365 Lippincott Williams & Wilkins, 2009

Unit-1	1. Manual, Semi Automatic and Automatic use of Blood pressure recording
Unit-2	2. Pressure transducers, Defibrillators, Cathode

ray tubes

Unit-3
3. Physiological monitors, plethysmography Pulse oximetry

Continuous Assessment Pattern

Internal Assessment (IA)	MTE	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Electrocardiography (P)				
Course Code	BCVT3053				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	0	0	2	1	

Course Objectives: **To get familiar with Basic Electrocardiography.**

Course Outcomes

CO1	To analyze and understand the ECG machine.
CO2	To analyze and understand the standard limb leads, augmented, limb leads
CO3	To analyze and understand the chest leads and Wisdom central terminal

Text Book (s) & Reference Book (s):

- Donald S. Baim, Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume Lippincott Williams & Wilkins, 2005**
- Morton L. Kern, Morton J. Kern. The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011**

**3. Patrick Kay, Manel Sabate, Marco A. Costa
Cardiac Catheterization and Percutaenous
Interventions Taylor & Francis, 2004**

Unit-1 1. Electrocardiography, Electrocardiographic lead systems
Unit-2 2. Standard limb leads, Precordial leads and the Wisdom central terminal
Unit-3 3. Augmented limb leads Electrical axis and ECGs.

Continuous Assessment Pattern

Internal Assessment (IA)	MTE	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Computer Fundamentals (P)				
Course Code	COMP1112				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	0	0	2	1	

Course Objectives: **The basic objective of this course is to get familiar with computers and programming Language.**

Course Outcomes

CO1	
CO2	
CO3	
CO4	
CO5	

Text Book (s):

1. Computer Fundamentals, Anita Goel
2. Computer Fundamentals, Rashmi Sharma
3. Computer Fundamentals and Programming in C, ReemaThareja
4. Computer Fundamentals (Book + CD-Rom), PradeepK.Sinha & Priti Sinha

Reference Book (s):

1. Computer Fundamentals, Dr. SushilaMadan
2. Computer Fundamentals and Information Technology, Ramesh Bangia

Software Lab to be used for the following:

1. **Windows, Managing Windows, Working with Disk, Folders and files.**
2. **MS-Office 2003 (MS Word, MS Power point, MS Excel, MS Access).**
3. **Computer Operating System Like DOS and Windows.**
4. **Internet Features (E-mail, Browser etc.)**

Unit-1
Unit-2
Unit-3
Unit-4
Unit-5

Continuous Assessment Pattern

Internal Assessment (IA)	MTE	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	CPR/Cardiac emergency-I				
Course Code	BCVT3006				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	2	0	0	2	

Course Objectives: **The basic objective of this course is to understand about basis life support and cardiac emergencies**

Course Outcomes

CO1	To understand and demonstrate basic life support.
CO2	To understand and demonstrate handling of medical emergencies like breathing problems.
CO3	To understand, demonstrate and handle medical emergencies like hypoglycaemia
CO4	To understand, demonstrate and handle injuries.
CO5	To understand, demonstrate and handle environmental emergencies.
CO6	To understand the recent trends in the management of cardiac arrest and other emergencies.

Text Book (s):

- Oxford Handbook of Accident and Emergency
- Oxford Handbook of Emergency Medicine
- BLS for Healthcare Providers Student Manual: Basic Life Support Handbook Book by Jane John-Nwankwo.
- Advanced First Aid, CPR, and AED: Sixth Edition. American College of Emergency Physicians.

Reference Book (s):

- Oxford Handbook of Cardiology (Oxford Medical Handbooks) by Punit Ramrakha (Author), Jonathan Hil
- Oxford Handbook of Clinical Specialities
- American Academy of Orthopaedic Surgeons. Jones & Bartlett Learning, The Textbook of Emergency Cardiovascular Care and CPR. Book by John M. Field

Reference websites:

- <https://www.bmj.com/content/314/7092/1462>

- <https://www.sciencedirect.com/science/article/pii/S0735109708034074>
- <https://www.ahajournals.org/>

Unit-1 6 hours Safety of the rescuer, basic life support, handling the airway, breathing and circulation	6
Unit-2 6 hours Breathing problems, Choking, Allergic reactions, Heart attack.	6
Unit-3 6 hours Diabetes and low blood sugar, Stroke, Seizures, Shock, Infections.	6
Unit-4 6 hours Bleeding, Wounds, Head, neck and spine injuries, fractures and sprains. Burns and electrical injuries.	
Unit-5 6 hours Bites and sting, Temperature-related emergencies, Poisoning and drug overdose.	6
Unit-6 Recent advances in emergency management 6 hours Cardio cerebral resuscitation (CCR), newer drugs in the management of emergencies, Extracorporeal CPR, Drugs used in advanced CPR.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Medical electronics, biophysics and computer usage relevant to cardiac technology-II			
Course Code	BCVT4001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: **The basic objective of this course is to get familiar with medical instruments and computer usage relevant with cardiac technology.**

Course Outcomes

CO1	To understand and analyze medical ultrasound, doppler and Electrocardiography.
CO2	Understanding the Electrocardiographic processing and display system.
CO3	Understanding and analyzing Radiation physics.
CO4	Understanding and interpreting techniques of monitoring radiation exposure and measures to reduce radiation exposure.
CO5	Interpreting Computer use in medical care and data entry.
CO6	To understand the latest techniques in MECT.

Text Book (s):

1. The Essential Physics of Medical Imaging by Jerrold T. Bushberg
The Essential Physics of Medical Imaging by Jerrold T. Bushberg
2. Radiologic Science for Technologists: Physics, Biology and Protection by Bushong

Reference Book (s):

1. Introduction to Medical Imaging-Nadine Barrie Smith and Andrew Webb, Publisher: Cambridge

- University Press, Genre: Technology & Engineering, ISBN: 9780521190657, 0521190657
2. The Essential Physics of Medical Imaging, Third Edition Third,
 3. by Jerrold T. Bushberg (Author), J. Anthony Seibert (Author), Edwin M. Leidholdt Jr. (Author), John M. Boone (Author)
 4. Medical Imaging: Principles and Practices
 5. Mostafa Analoui, Joseph D. Bronzino, Donald R. Peterson

Unit-1 8 hours Ultrasound- Medical ultrasound and Doppler Ionic currents and Electrocardiography
Unit-2 8 hours Electrocardiography- Electrocardiographic processing and display system
Unit-3 8 hours Radiation- Radiation physics
Unit-4 8 hours Radiation Techniques of monitoring radiation exposure Measures to reduce radiation exposure
Unit-5 8 hours Computer use in medical care and data entry
Unit-6 8 hours Advances/Recent trends in MECT

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Basic Electrocardiography-II			
Course Code	BCVT4002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: **To get familiar with Basic Electrocardiography.**

Course Outcomes

CO1	To analyze and interpret normal ECG
CO2	To interpret the P wave
CO3	To analyze atrioventricular conduction, PR and QRS intervals
CO4	To interpret ventricular repolarization and ST-T interval
CO5	To analyze and interpret rate and rhythm of heart through ECG
CO6	To develop relevance and need of recent trends in ECG devices and remote monitoring

Text Book (s):

- 1. Guyton & Hall Text Book of Physiology**
- 2. The ECG Made Easy Book by John R Hampton**
- 3. Textbook of Clinical Electrocardiography S N Chugh**
- 4. 12-Lead Ecg: The Art of Interpretation by Casimiro Garcia**

Reference Book (s):

- 1. Clinical Electrocardiography: A Textbook by Antonio Bay's de Luna**
- 2. ECG TEXTBOOK: Theory and Practical Fundamentals 2017 by OPRET (Author)**

Unit-1
8 hours
Normal Electrocardiogram-
The normal electrocardiogram, Atrial activation

Unit-2
8 hours
P wave
The normal P wave Atrial repolarization
Unit-3
8 hours
Atrioventricular node
Atrioventricular node conduction and the PR segment Ventricular activation and the QRS complex
Unit-4
8 hours
Ventricular Repolarization
Ventricular recovery and ST-T wave, U wave
Normal variants
Unit-5
8 hours
Rate and rhythm
Unit 6:
8 Hours
Recent Trends in ECG monitoring
Recent Trends in ECG devices and remote monitoring

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Advanced Electrocardiography-II			
Course Code	BCVT4003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: **To get familiar with Advanced Electrocardiography.**

Course Outcomes

CO1	To analyze and interpret the abnormal ECG, left and right atrial abnormality
CO2	To analyze and interpret diseases associated

	with ventricles from the ECG
CO3	To analyze and interpret fascicular blocks
CO4	To analyze and interpret left and right bundle branch blocks from the ECG
CO5	To analyze and interpret various changes associated with myocardial infarction from the ECG
CO6	To develop an understanding of recent advances in ECG diagnosis for atrial, ventricular and MI abnormalities.

Text Book (s):

1. Guyton & Hall Text Book of Physiology
2. The ECG Made Easy Book by John R Hampton
3. Textbook of Clinical Electrocardiography S N Chugh
4. 12-Lead Ecg: The Art of Interpretation by Casimiro Garcia

Reference Book (s):

1. Practical electrocardiography Book by Henry J. L. Marriott
2. Clinical Electrocardiography: A Textbook by Antonio Bay's de Luna
3. ECG TEXTBOOK: Theory and Practical Fundamentals 2017 by OPRET (Author)
4. Ganong Text Book of Physiology

Unit-1 8 hour Abnormalities of rate and rhythm The abnormal electrocardiogram, Left atrial abnormality, Right atrial abnormality
Unit-2 8 hours Left ventricular hypertrophy and enlargement, Right ventricular hypertrophy and enlargement, Intraventricular conduction delays
Unit-3 8 hours Left anterior fascicular block, Left posterior fascicular block
Unit-4 8 hours Left bundle branch block, Right bundle branch

block
Unit-5 8 hours Myocardial ischemia and infarction, Repolarization (ST-Twave) abnormalities, QRS changes
Unit-6 Recent advances in the ECG diagnosis for various abnormalities for atrial, ventricular and MI abnormalities. 8 hours

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Medical electronics, biophysics and computer usage relevant to cardiac technology-II (P)			
Course Code	BCVT4051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: **The basic objective of this course is to get familiar with medical instruments and computer usage relevant with cardiac technology.**

Course Outcomes

CO1	To understand, and interpret the usage BP monitoring devices.
CO2	To understand, and interpret the usage of Pressure transducers, Defibrillators, Cathode ray tubes
CO3	To understand, and interpret the usage plethysmography Pulse oximetry

Text Book (s):

- 1 The Essential Physics of Medical Imaging by Jerrold T. Bushberg
The Essential Physics of Medical Imaging by Jerrold T. Bushberg
- 2 Radiologic Science for Technologists: Physics, Biology and Protection by Bushong

Reference Book (s):

6. Introduction to Medical Imaging-Nadine Barrie Smith and Andrew Webb, Publisher: Cambridge University Press, Genre: Technology & Engineering, ISBN: 9780521190657, 0521190657
7. The Essential Physics of Medical Imaging, Third Edition Third,
8. by Jerrold T. Bushberg (Author), J. Anthony Seibert (Author), Edwin M. Leidholdt Jr. (Author), John M. Boone (Author)
9. Medical Imaging: Principles and Practices
10. Mostafa Analoui, Joseph D. Bronzino, Donald R. Peterson

Unit-1 Manual, Semi-automatic and Automatic use of Blood pressure recording
Unit-2 Pressure transducers, Defibrillators, Cathode ray tubes
Unit-3 Physiological monitors, plethysmography Pulse oximetry

Continuous Assessment Pattern

Internal Assessment (IA)	MTE	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Basic Electrocardiography-II (P)
Course Code	BCVT4052
Prerequisite	
Corequisite	
Antirequisite	

	L	T	P	C
	0	0	2	1

Course Objectives: **To get familiar with Basic Electrocardiography.**

Course Outcomes

CO1	To analyze and understand the latest ECG machine.
CO2	To analyze and understand recording ECG in neonates
CO3	To analyze and understand the recording of ECG in adults and elderly patients.

Text Book (s):

1. Guyton & Hall Text Book of Physiology
2. The ECG Made Easy Book by John R Hampton

Reference Book (s):

1. Practical electrocardiography Book by Henry J. L. Marriott
2. Clinical Electrocardiography: A Textbook by Antonio Bay's de Luna

Unit-1 To analyze the latest types of ECG machines available
Unit-2 Recording ECG in the neonate
Unit-3 Recording ECG in the elderly.

Continuous Assessment Pattern

Internal Assessment (IA)	MTE	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	CPR/Cardiac Emergency-II
Course Code	BCVT4005
Prerequisite	
Corequisite	
Antirequisite	

	L	T	P	C
	3	0	0	3

Course Objectives: **The basic objective of this course is to understand about basis life support and cardiac emergencies**

Course Outcomes

CO1	To understand and demonstrate administration of CPR to an adult and child.
CO2	To understand and interpret cardiac emergencies like angina and myocardial infarction.
CO3	To understand and interpret cardiac emergencies like supraventricular tachycardia
CO4	To demonstrate and handle defibrillators.
CO5	To understand and interpret cardiac like cardiac tamponade and sudden cardiac death.
CO6	To understand recent trends in cardiac emergency/CPR.

Text Book (s):

1. Oxford Handbook of Accident and Emergency
The ECG Made Easy Book by John R Hampton
2. Oxford Handbook of Clinical Specialities
3. Oxford Handbook of Cardiology (Oxford Medical Handbooks) by Punit Ramrakha (Author), Jonathan Hill
4. Oxford Handbook of Emergency Medicine

Reference Book (s):

1. Emergency Cardiology: An Evidence-Based Guide to Acute Cardiac Problems (Medicine) 1st Edition
2. Harrison's Cardiovascular Medicine
3. Emergencies in Cardiology by Saul G. Myerson (Editor), Robin P. Choudhury (Editor)
4. Cardiology: An Illustrated Textbook (Two Volume Set) by Kanuchatterje

Unit-1

8 hours Cardio Pulmonary Resuscitation Give CPR to an adult, child and infant, usage of mask, bag-mask. Rescue breathing in adult, child and infant
Unit-2 8 hours Acute Coronary Syndrome Acute angina, unstable angina myocardial ischaemia, Q wave and Non-Q wave myocardial infarction
Unit-3 8 hours Supraventricular emergencies Supraventricular tachycardia, ventricular tachycardia, ventricular fibrillation
Unit-4 8 hours Defibrillators Types of defibrillators, uses, methods of using, types of electrodes, types of paddles.
Unit-5 8 hours Cardiorespiratory Arrest Causes of primary cardiac arrest, Cardiac tamponade and sudden cardiac death.
Unit 6 Advances/Recent trends in cardiac emergency/CPR

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Treadmill exercise stress testing and 24 hour Ambulatory ECG recording			
Course Code	BCVT5001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

To get familiar with Treadmill exercise stress testing and 24 hour Ambulatory ECG recording.

Course Outcomes

CO1	Analyze and understand Functioning of Treadmill
CO2	Analyze and understand ST segment changes
CO3	Analyze and understand the indications and contraindications in exercise testing
CO4	Analyze and understand cardiac arrhythmias and conduction disturbances during stress testing.
CO5	Analyze and understand Holter Monitoring
CO6	To develop understanding regarding latest techniques used in stress test.

Text Book (s) & Reference Book (s)

1. Stress Testing: Principles and Practice By Myrvin H.Ellestad
2. Ambulatory Monitoring, BY CSCT
3. Principle and practice of tmt,by Myrvin.
4. 12-Lead Ecg: The Art Of Interpretation by Casimiro Garcia

Course Content

Unit-1	8 hours
Exercise physiology, protocols, Lead systems, Patient preparation	
Unit-2	8 hours
ST segment displacement – types and measurement, Non electrocardiographic observations	
Unit-3	8 hours
Exercise test indications, contra-indications and precautions.	
Unit-4	8 hours
Cardiac arrhythmias and conduction disturbances during stress testing, Emergencies in the stress testing laboratory.	
Unit-5	8 hours
Principles of Holter Recording, Connections of the Holter recorder, Holter Analysis for ambulatory electrocardiography.	
Unit 6	8 hours
To develop understanding regarding latest techniques using in stress test.	
Different types of ambulatory ecg monitoring	
Ambulatory real-time cardiac monitors	
Adhesive patch electrocardiographic monitors	
Implantable loop recorders	
Event monitors	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Echocardiography			
Course Code	BCVT5002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

To get familiar with echocardiography

Course Outcomes

CO1	To analyze and interpret Fundamental principles of echocardiography
CO2	To analyze and interpret echocardiography of the heart.
CO3	To analyze and interpret valvular heart disease.
CO4	To analyze and interpret Atrial septal defect, Ventricular septal defect, Patent ductus arteriosus, Pulmonary stenosis, Tetralogy of Fallot, Coarctation of aorta, Left atrial thrombus, Left atrial myxoma
CO5	To analyze and interpret various changes associated with myocardial infarction from the Echocardiography
CO6	To develop understanding regarding recent advancement in echocardiography

Text Book (s)

- The Washington Manual of Echocardiography by Nishath Quader M.D. (Author)
- Practice of Clinical Echocardiography 5th Edition by Catherine M. Otto MD (Author)
- The Digital Echo Atlas: A Multimedia Reference by Stephen Clements M.D. (Author)

Reference Book (s)

- The Washington Manual of Echocardiography by Nishath Quader M.D. (Author)
- Practice of Clinical Echocardiography 5th Edition by Catherine M. Otto MD (Author)
- SN Chugh, ECG made easy

Course Content

Unit 1	8 hours
M- Mode and 2D transthoracic echocardiography, Views used in transthoracic echocardiography, Doppler echocardiography: pulsed, continuous wave and colour	
Unit 2	8 hours
Measurement of cardiac dimensions Evaluation of systolic and diastolic left ventricular function, Regional wall motion abnormalities, Stroke volume and cardiac output assessment, Transvalvular gradients, Orifice area, Continuity equation	
Unit 3	8 hours
Echocardiography in Valvular heart disease: Mitral stenosis, Mitral regurgitation, Mitral valve prolapsed, Aortic stenosis, Aortic regurgitation, Infective endocarditis Prosthetic valve assessment,	
Unit 4	8 hours
Echocardiography in Cardiomyopathies: Dilated, Hypertrophic, Restrictive, Constrictive pericarditis, pericardial effusion and cardiac tamponade,	
Unit 5	8 hours
Echocardiographic detection of congenital heart	

disease: Atrial septal defect, Ventricular septal defect, Patent ductus arteriosus, Pulmonary stenosis, Tetralogy of Fallot, Coarctation of aorta, Left atrial thrombus, Left atrial myxoma, Transoesophageal echocardiography.

Unit 6 8 hours

Recent Advances in Echocardiography
 Contrast Echo Assessment of Myocardial Perfusion,
 Exercise stress echocardiography
 Using echocardiography to assess ischemia
 Adaptive contrast enhancement
 Tissue Doppler imaging
 Speckle-tracking echocardiography
 Three-dimensional speckle-tracking echocardiography

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	ADVANCED ELECTRO-CARDIOGRAPHY-II			
Course Code	BCVT5003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:
 To get familiar with advanced electrocardiography

Course Outcomes

CO1	To analyze and interpret the changes seen
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in the cardia after ischaemic damage.

CO2	To analyze and interpret diseases associated with electrolyte imbalances.
CO3	To analyze and interpret ventricular arrhythmias.
CO4	To analyze and interpret heart blocks.
CO5	To analyze and interpret cardioversions and defibrillators.
CO6	To understand the latest techniques in the management of cardiac arrhythmias.

Text Book (s)

1. Textbook of Clinical Electrocardiography S N Chugh
2. The ECG Made Easy Book by John R Hampton
3. Guyton & Hall Text Book of Physiology
4. 12-Lead Ecg: The Art Of Interpretation by Casimiro Garcia

Reference Book (s)

1. Practical electrocardiography Book by Henry J. L. Marriott
2. Clinical Electrocardiography: A Textbook by Antonio Bay's de Luna
3. ECG TEXTBOOK: Theory and Practical Fundamentals 2017 by OPRET (Author)
4. Ganong Text Book of Physiology

Reference websites:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4554791/>
2. <https://royalsocietypublishing.org/doi/10.1098/rsif.2017.0821>
3. <https://www.dicardiology.com/article/advance-s-ecg-technology>
4. <https://www.intechopen.com/books/advances-in-electrocardiograms-methods-and-analysis>

Unit-1 Evolution of electrocardiographic changes, Localization of ischemia or infarction, Q waves, Primary and secondary T wave changes	8 hours	1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
Unit-2 Electrolyte and metabolic ECG abnormalities, Cardiac arrhythmias, Supraventricular, tachycardia, Atrial flutter/fibrillation.	8 hours	2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
Unit-3 Ventricular Tachycardia/Ventricular fibrillation, Atrial premature beats, Prolonged PR interval.	8 hours	3. To help students understand the meaning of happiness and prosperity for a human being.
Unit-4 Mobitz type 1 and 2 block, Complete heart block, Direct Current (DC) shock.	8 hours	4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
Unit-5 Defibrillator, Monophasic and biphasic shock, Technique of cardioversion for cardioversion.	8 hours	5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life
Unit 6: Recent trends in electrocardiography Remote ECG monitoring systems, Computational techniques for ECG analysis and interpretation, non contact heart monitoring.	8 hours	Course Outcomes

CO1	To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
CO2	To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
CO3	To help students understand the meaning of happiness and prosperity for a human being.
CO4	To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
CO5	To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Universal Human Values and Ethics			
Course Code	LLLL1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

Text Book (s)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics..

Reference Book (s)

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, JeevanVidyaEkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajan, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human

Values), Eastern Economy Edition, Prentice Hall of India Ltd.

11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow.Reprinted 2008.

Course Content**Unit-1****6 hours****Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. **Understanding the need, basic guidelines, content and process for Value Education**
2. **Self - Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self - exploration**
3. **Continuous Happiness and Prosperity- A look at basic Human Aspirations**
4. **Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority**
5. **Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario**
6. **Method to fulfill the above human aspirations: understanding and living in harmony at various levels.**

Unit-2 8 hours
Understanding Harmony in the Human Being - Harmony in Myself
<ol style="list-style-type: none"> 1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 4. Understanding the characteristics and activities of 'I' and harmony in 'I' 5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of physical needs, meaning of Prosperity in detail 6. Programs to ensure Sanyam and Swasthya
Unit-3 9 hours
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship
<ol style="list-style-type: none"> 1. Understanding harmony in the Family- the basic unit of human interaction 2. Understanding values in human-human relationship; meaning of <i>Nyaya</i> and program for its fulfillment to ensure <i>Ubhay-tripti</i>; Trust (<i>Vishwas</i>) and Respect (<i>Samman</i>) as the foundational values of relationship 3. Understanding the meaning of <i>Vishwas</i>; Difference between intention and competence 4. Understanding the meaning of <i>Samman</i>, Difference between respect and

<p>differentiation; the other salient values in relationship</p> <ol style="list-style-type: none"> 5. Understanding the harmony in the society (society being an extension of family): <i>Samadhan</i>, <i>Samridhi</i>, <i>Abhay</i>, <i>Sah-astitva</i> as comprehensive Human Goals 6. Visualizing a universal harmonious order in society- Undivided Society (<i>AkhandSamaj</i>), Universal Order (<i>SarvabhaumVyawastha</i>)- from family to world family!
Unit-4 8 hours
Understanding Harmony in the Nature and Existence - Whole existence as Co –existence -
<ol style="list-style-type: none"> 1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature 3. Understanding Existence as Co-existence (<i>Sah-astitva</i>) of mutually interacting units in all-pervasive space 4. Holistic perception of harmony at all levels of existence
Unit-5 9 hours
Implications of the above Holistic Understanding of Harmony on Professional Ethics
<ol style="list-style-type: none"> 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. 4. Competence in Professional Ethics: <ol style="list-style-type: none"> a) Ability to utilize the professional competence for augmenting universal human order,

<p>b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models</p> <p>5. Case studies of typical holistic technologies, management models and production systems</p> <p>6. Strategy for transition from the present state to Universal Human Order:</p> <p>a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers</p> <p>b) At the level of society: as mutually enriching institutions and organizations</p>

	of proper and safe disposal of bio-medical waste & treatment.
CO4	To interpret and analyze diseases & risk factors behind occurrence of cardiac abnormalities.
CO5	To analyze and interpret ECG, echocardiography and defibrillation.
CO6	To develop understanding regarding recent advancement in health care technologies

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardiac Care Technician- I			
Course Code	BCCT5004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	8	0	0	8

Course Objectives:

The basic objective of this course is to get familiar with cardiac care technology

Course Outcomes

CO1	To analyze and interpret Healthcare Service Providers and sample collection
CO2	To develop understanding of the concept of Healthy Living, procedures of Hand Hygiene and vaccination against common Infectious Diseases.
CO3	To understand and analyze the importance

Text Book (s)

1. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011
3. Cardiac Monitor Technician Textbook: Theory and Hands On Approach By: Sultan, et al. Khan (Author), Faisal Khan MD

Reference Book (s)

1. Cardiac Monitor Technician Textbook: Theory and Hands On Approach By: Sultan, et al. Khan (Author), Faisal Khan MD
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011

Reference websites:

1. <https://www.who.int/>
2. <https://www.gminsights.com/blogs/PPE-market-trends>
3. <https://www.ifc.org/>
4. <https://www.beckershospitalreview.com/>

Course Content

CO1	Unit I	16
	hours	
	Basic understanding of Healthcare Service Providers (primary, secondary & tertiary),	

	<p>cardiac department in a hospital, Understanding different parts of body, functions to be performed by CCT</p> <ul style="list-style-type: none"> • To understand various types of procedures carried out in the cardiac catheterization laboratory and other labs carrying out diagnostic. • To gain broad understanding regarding <p>Type of Sample</p> <ul style="list-style-type: none"> • Sample Handling • Different equipment useful & correct method for blood sample collection • Correct procedure of sample transportation. • To exhibit Ethical Behavior and understanding of administrative functions of CCT • To understand the need for counseling patient and family before, during and after the procedure (s) 	<p>safety and security requirement at a health care unit.</p> <ul style="list-style-type: none"> • To develop an understanding for handling the hazardous situation safely. • Describe basics of first aid to develop understanding and precautions to ensure self safety. • To understand the role of an CCT in monitoring healthy and safe environment. • To understand the safety measures for disabled, pediatric & geriatric patients, impact of medical negligence in clinical management and their different types • To understand Surgical Site Infection and measures to prevent them, strategies which can be initiated for minimizing risk for patients • To develop broad understanding regarding role of hospital on the occurrence of a disaster • To understand fire prevention strategies and electrical safety measures which should be known to health worker
CO2	<p>Unit 2 16 hours</p> <p>To develop understanding of the concept of Healthy Living, procedures of Hand Hygiene</p> <ul style="list-style-type: none"> • To develop techniques of Grooming, use of PPE • To ensure vaccination against common Infectious Diseases. <p>To understand regarding environmental</p>	<p>CO3 Unit 3 16 hours</p> <p>To gain understanding of importance of proper and safe disposal of bio-medical waste & treatment</p> <ul style="list-style-type: none"> • To gain understanding of categories of biomedical waste, disposal of bio-medical waste – colour coding, types of containers,

	<p>transportation of waste, etc.</p> <ul style="list-style-type: none"> • To gain broad understanding of standards for bio-medical waste disposal, means of biomedical waste treatment • To understand the role of an infection control team <p>To develop an understanding of Cardiovascular System</p> <ul style="list-style-type: none"> • Basic understanding regarding size, shape, location and different layers of the heart, SA node and its functional significance, coronary circulation, different sounds produced in the heart and what is its significance. 	<p>Testing</p> <ul style="list-style-type: none"> • To develop an understanding regarding Echocardiography, position of transducers, role of CCT while assisting cardiologist during Echocardiography / cardiac ultrasound <p>To understand the importance of hand washing and its steps</p> <ul style="list-style-type: none"> • To understand; Needle Stick Injuries (NSI) • To gain understanding regarding transmission based precautions and & its types, meaning of ventilation and state it's clinical significance, principles of linen management • To understand the process of cleaning, sterilization and disinfection of equipment and lab along with its significance • To understand various occupational hazards for a health worker Sensitization & overview regarding Cardiac Arrest • To understand regarding fundamentals of early defibrillation • To understand principles of BLS (Adult chain of survival, CABD's of giving CPR), • To understand operation of AED • Principles of Adult BLS/Child BLS/Infant BLS
CO4	<p>Unit 4 16 hours</p> <p>To understand cardiovascular diseases & risk factors behind occurrence of cardiac abnormalities</p> <ul style="list-style-type: none"> • To develop an understanding regarding various diseases of heart • To understand the significance of coronary circulation, systemic circulation , types of vessels etc. • To Identify the warning signs and symptoms of heart related disease condition 	
CO5	<p>Unit 5 16 hours</p> <p>To develop understanding regarding ECG & it's procedure, different wave forms in ECG & common interpretation, Tilt Table</p>	

CO6	Unit 6 8 hours Recent advancement in health care technologies <ul style="list-style-type: none"> • To develop understanding regarding recent advancement in personal protective equipment & benefits of innovation in PPE • To develop understanding regarding environmental, health and safety guidelines • To develop understanding regarding technological advancement for health care
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Course Outcomes

CO1	Analyze and understand Functioning of Treadmill
CO2	Analyze and understand the Exercise test indications, contra-indications
CO3	Analyze and understand the Holter Recording.

Text Book (s) & Reference Book (s)

Stress Testing: Principles and Practice By Myrvin H. Ellestad

Course Content

Functioning of Treadmill, Exercise test indications, contra-indications and precautions & Holter Recording.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks			
10	20	70	100			
Name of The Course	Treadmill exercise stress testing and 24 hour Ambulatory ECG recording (P)					
Course Code	BCVT5051					
Prerequisite						
Corequisite						
Antirequisite						
	L	T	P	C		
	0	0	2	1		

Course Objectives:

To get familiar with Treadmill exercise stress testing and 24 hour Ambulatory ECG recording.

Name of The Course	Echocardiography (P)				
Course Code	BCVT5052				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	0	0	2	1	

Course Objectives:

To get familiar with echocardiography

Course Outcomes

CO1	Analyze and understand the echocardiography machine
CO2	Analyze and understand the Doppler

	echocardiography machine
CO3	Analyze and understand the Doppler echocardiography machine
CO4	Analyze and understand regional wall motion abnormalities
CO5	Understand and interpret stroke volume and cardiac output assessment.

Text Book (s) & Reference Book (s)

1. Echo Made Easy-Sam Kaddoura
2. Echocardiography – Feigenbaum

Course Content

Echocardiography, Doppler echocardiography: pulsed, continuous wave and colour, Evaluation of systolic and diastolic left ventricular function, Regional wall motion abnormalities, Stroke volume and cardiac output assessment,.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks			
10	20	70	100			
Name of The Course	Cardiac Care Technician-I(Practical)					
Course Code	BCCT5053					
Prerequisite						
Corequisite						
Antirequisite						
			L	T	P	C
			0	0	4	2

Course Objectives:

The basic objective of this course is to get familiar with cardiac care technology

Course Outcomes

CO1	Analyze and understand sample collection
CO2	Analyze and understand safe medical practices
CO3	Analyze and understand safe waste disposal methods
CO4	Analyze and understand risk factors in cardiac diseases
CO5	To understand CPR/BLS

Text Book (s)

1. Principles and practice of Medicine by Davidson
2. Harrisons Text Book of Medicine

Course Content

Unit-1 Basic understanding of Healthcare Service Providers (primary, secondary & tertiary), cardiac department in a hospital, Understanding different parts of body, functions to be performed by CCT

- **To understand various types of procedures carried out in the cardiac catheterization laboratory and other labs carrying out diagnostic.**
- **To gain broad understanding regarding Type of Sample**
- **Sample Handling**
- **Different equipment useful & correct method for blood sample collection**
- **Correct procedure of sample transportation.**
- **To exhibit Ethical Behavior and understanding of administrative functions of CCT**

- To understand the need for counseling patient and family before, during and after the procedure (s)

Unit-2 To develop understanding of the concept of Healthy Living, procedures of Hand Hygiene

- To develop techniques of Grooming, use of PPE
- To ensure vaccination against common Infectious Diseases.

To understand regarding environmental safety and security requirement at a health care unit.

- To develop an understanding for handling the hazardous situation safely.
- Describe basics of first aid to develop understanding and precautions to ensure self safety.
- To understand the role of an CCT in monitoring healthy and safe environment.
- To understand the safety measures for disabled, pediatric & geriatric patients, impact of medical negligence in clinical management and their different types
- To understand Surgical Site Infection and measures to prevent them, strategies which can be initiated for minimizing risk for patients
- To develop broad understanding regarding role of hospital on the occurrence of a disaster
- To understand fire prevention strategies and electrical safety measures which should be known to health worker

Unit-3 To gain understanding of importance of proper and safe disposal of bio-medical waste & treatment

- To gain understanding of categories of biomedical waste, disposal of bio-medical waste – colour coding, types of containers, transportation of waste, etc.
- To gain broad understanding of standards for bio-medical waste disposal, means of biomedical waste treatment

- To understand the role of an infection control team

To develop an understanding of Cardiovascular System

- Basic understanding regarding size, shape, location and different layers of the heart, SA node and its functional significance, coronary circulation, different sounds produced in the heart and what is its significance

Unit-4 To understand cardiovascular diseases & risk factors behind occurrence of cardiac abnormalities

- To develop an understanding regarding various diseases of heart
- To understand the significance of coronary circulation, systemic circulation, types of vessels etc.
- To Identify the warning signs and symptoms of heart related disease condition

Unit-5 To develop understanding regarding ECG & its procedure, different wave forms in

ECG & common interpretation, Tilt Table Testing

- To develop an understanding regarding Echocardiography, position of transducers, role of CCT while assisting cardiologist during Echocardiography / cardiac ultrasound

To understand the importance of hand washing and its steps

- To understand; Needle Stick Injuries (NSI)
- To gain understanding regarding transmission based precautions and its types, meaning of ventilation and state its clinical significance, principles of linen management
- To understand the process of cleaning, sterilization and disinfection of equipment and lab along with its significance
- To understand various occupational hazards for a health worker Sensitization & overview regarding Cardiac Arrest
- To understand regarding fundamentals of early defibrillation
- To understand principles of BLS (Adult chain of survival, CABD's of giving CPR),
- To understand operation of AED
- Principles of Adult BLS/Child BLS/Infant BLS

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Ultrasonography
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Course Code	BCVT5005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: To get familiar with ultrasonography.

Course Outcomes

CO1	To interpret and analyze the principles of ultrasonography.
CO2	To analyze and understand Sonographic Phenomenons and Artefacts, Examination Techniques
CO3	To understand and interpret ultrasound of thorax and heart.
CO4	To understand and analyze the vascular system.
CO5	To understand and analyze interventional ultrasonography.
CO6	To understand and elaborate on the latest trends in ultrasonography.

Text Book (s):

1. Diagnostic Imaging Ultrasound by Anil T. Ahuja (Author), James F. Griffith (Author), K. T. Wong (Author), Gregory E., M.D. Antonio (Author).
2. Manual Of Ultrasound Paperback –by Garkal G
3. Textbook of Diagnostic Sonography: 2-Volume
4. by Sandra L. Hagen-Ansert MS RDMS RDCS FASE FSDMS (Author)

Reference Book (s):

1. Diagnostic Imaging Ultrasound by Anil T. Ahuja (Author), James F. Griffith (Author), K. T. Wong (Author), Gregory E., M.D. Antonio (Author).

2. Manual Of Ultrasound Paperback –by Garkal G
3. Textbook of Diagnostic Sonography: 2-Volume
4. by Sandra L. Hagen-Ansert MS RDMS RDCS
FASE FSDMS (Author)

Reference websites:

1. www.radiopedia.org
2. <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/ultrasonography>
3. <https://www.expresshealthcare.in/specials/in-imaging-specials/recent-advances-in-ultrasound-imaging-technology/248386/>

Unit-1 Principles of ultrasonography Terminology, Physical and Technical Principles	6 hours
Unit-2 Examination Techniques Sonographic Phenomenons and Artefacts,	6 hours
Unit-3 Ultrasound of the Thoracic Cavity and Heart Diaphragm, Echocardiography - normal heart, Echocardiography - heart disease	6 hours
Unit-4 Ultrasonography of Vascular system Carotid vessels, vertebral artery, Aorta, Blood vessels of the lower limb	6 hours
Unit-5 Special Diagnostic Procedures Ultrasound -Guided biopsy ,Monitoring Bone Healing ,Three-dimensional Ultrasonography, Interventional Ultrasonography	6 hours
Unit-6 Recent trends in ultrasonography Hand held ultrasound, real time 3D and 4D ultrasound	6 hours

Continuous Assessment Pattern

Internal Assessment	Mid Term Test	End Term Test	Total Marks
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(IA)	(MTE)	(ETE)	
10	20	70	100

Name of The Course	Doppler			
Course Code	BCVT5006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: **To get familiar with doppler.**

Course Outcomes

CO1	To interpret and analyze the principles of doppler.
CO2	To analyze and understand sonographic phenomenons and Artefacts, Examination Techniques
CO3	To understand and interpret doppler of thorax and heart.
CO4	To understand and analyse the vascular system.
CO5	To understand and analyze interventional doppler.
CO6	To understand and elaborate on the latest trends in doppler.

Text Book (s):

1. Diagnostic Imaging Ultrasound by Anil T. Ahuja (Author), James F. Griffith (Author), K. T. Wong (Author), Gregory E., M.D. Antonio (Author).
2. Manual Of Ultrasound Paperback –by Garkal G
3. Textbook of Diagnostic Sonography: 2-Volume
4. by Sandra L. Hagen-Ansert MS RDMS RDCS
FASE FSDMS (Author)

Reference Book (s):

1. Diagnostic Imaging Ultrasound by Anil T. Ahuja (Author), James F. Griffith (Author), K. T. Wong (Author), Gregory E., M.D. Antonio (Author).
2. Manual Of Ultrasound Paperback –by Garkal G
3. Textbook of Diagnostic Sonography: 2-Volume
4. by Sandra L. Hagen-Ansert MS RDMS RDCS FASE FSDMS (Author)

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Reference websites:

1. www.radiopedia.org
2. <https://medlineplus.gov/lab-tests/doppler-ultrasound/>
3. <https://www.radiologyinfo.org/en/glossary/glossary1.cfm?gid=96>

Unit-1 Terminology, Physical and Technical Principles Principles of doppler	6 hours
Unit-2 Sonographic Phenomenons and Artefacts, Examination Techniques	6 hours
Unit-3 Doppler of the Thoracic Cavity and Heart Diaphragm, Echocardiography - normal heart, Echocardiography - heart disease	
Unit-4 Doppler of Vascular system Carotid vessels, vertebral artery, Aorta, Blood vessels of the upper and lower limbs	6 hours
Unit-5 Special Diagnostic Procedures Doppler -Guided biopsy, Monitoring Bone Healing, Three-dimensional doppler, Interventional Doppler.	6 hours
Unit-6 Recent trends in Doppler Spectral Doppler, Colour doppler	6 hours

Continuous Assessment Pattern

Name of The Course	Cardiac catheterization laboratory basics			
Course Code	BCVT6001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: To get familiar with Cardiac catheterization laboratory basics.

Course Outcomes

CO1	Students will be able to understand, differentiate and use different types of catheters, equipment used in a cathlab and their sterilization
CO2	Students will be able to understand how to record intra cardiac pressures and its application.
CO3	Students will be able to understand cardiac output determination methods and shunt detection.
CO4	Students will be able to understand Coronary angiography and its procedure.
CO5	Students will be able to understand the procedure of Left Ventriculography and right heart catheterization.
CO6	Student will able to develop relevance and need of recent trends in cath laboratory

Text Book (s):

- 1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005**
- 2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011**
- 3. Echocardiography – Feigenbaum**

Reference Book (s):

- 1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005.**

- 2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011**

Unit-1 Introduction 8 hours
Catheters & Catheterization- Types of catheters, catheter cleaning and packing, Techniques of sterilization; advantages and disadvantages of each, setting up the cardiac catheterization laboratory for a diagnostic study, Table movement, Image intensifier movement, Image play back.
Unit-2 8 hours
Intracardiac Pressures- Intra cardiac pressures, Pressure recording systems, Fluid filled catheters versus catheter tipped manometers, artifacts, damping, ventricularization, Pressure gradient recording pullback, peak-to peak.
Unit-3 8 hours
Determination of Cardiac output- Cardiac output determination, Thermo dilution method, Oxygen dilution method, Principles of oximetry, Shunt detection and calculations.
Unit-4 8 Hours
Angiography- Coronary angiography, Coronary angiographic catheters, Use of the manifold, Angiographic views in coronary angiography, Laboratory preparation for coronary angiography.
Unit-5 8 Hours
Ventriculography- Left Ventriculography – catheters, views, use of the injector, Right heart catheterization and Angiography
Unit VI: Recent Trends in Cath Lab practices 8 Hours
Recent Trends in Cath Lab practices, Newer concept and devices used

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	CARDIAC CATHETERIZATION LABORATORY ADVANCED			
Course Code	BCVT6002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: To get familiar with cardiac catheterization laboratory advanced.

Course Outcomes

CO1	Students will be able to identify and evaluate Fundamental principles of Aortic angiography, Coronary angioplasty, Balloon Mitral valvuloplasty.
CO2	Students will be able to identify and evaluate Fundamental principles of Coronary angioplasty.
CO3	Students will be able to identify and evaluate Techniques and hardware used in BMV, Setting up the laboratory for a BMV case Technique and equipment used for trans-septal puncture.
CO4	Students will be able to identify and evaluate Thromboembolic disease, Indications and use of venacaval filters, Techniques of thrombolysis.
CO5	Students will be able to identify and evaluate Catheters used in electrophysiology studies, Connection of catheters.
CO6	To understand the latest trends in the management of blocks and valve disorders.

Text Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005.
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.
3. Echocardiography – Feigenbaum

Reference Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins, 2005.
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011

Unit-1 Introduction

8 hours

Aortic angiography – aortic root, arch, abdominal aorta, Peripheral angiography and carbondioxide angiography, Catheterization and angiography in children with congenital heart disease, Contrast agents: Ionic and non-ionic, Types of non-ionic agents, Contrast nephropathy, Measures to reduce incidence of contrast nephropathy.

Unit-2

Coronary angioplasty (PTCA), Equipment and hardware used in PTCA: Guiding catheters, Guidewires, Balloons, Stents, Setting up the laboratory for a PTCA case Management of complications: Slow flow/no flow, acute stent thrombosis, Dissection, Perforation Pediatric Interventions: Aortic and pulmonary valvuloplasty, Coarctation angioplasty and stenting, Device closure of PDA, ASD, VSD, Technique and devices used, Sizing of devices, Coil.

Unit-3

8 Hours

Balloon Mitral valvuloplasty (BMV): Techniques and hardware used in BMV, Setting up the

laboratory for a BMV case Technique and equipment used for trans-septal puncture, Recording of transmitral pressure gradients, Management of cardiac tamponade, Peripheral interventions, Equipment and techniques used, Endovascular exclusion of aneurysms Self-expanding stents, covered stents and cutting balloons, Intra-aortic balloon pump (IABP) Theory of intra -aortic balloon counter pulsation, Indications for IABP use, setting up the IABP system.

Unit-4
8 Hours

Thromboembolic disease, Indications and use of venacaval filters, Techniques of thrombolysis – drug and catheters used, Thrombus aspirations systems – coronary, peripheral, Cardiac pacing, Temporary pacing – indications, technique, Permanent pacing, Indications, Types of pacemakers and leads, setting up the laboratory for permanent pacing, Pacemaker parameter checking, Follow-up of pacemaker patients.

Unit-5
8 Hours

Cardiac electrophysiology, Catheters used in electrophysiology studies, Connection of catheters during an EP study, Equipment used in arrhythmia induction and mapping Radiofrequency ablation, Image archival systems and compact disc (CD) writing.

Unit-6 **Recent trends in interventional cardiology**
8 Hours

ECHO pixel created live 3D holograms, Polymer drug eluting stents, transcatheter aortic valve replacement.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Research Methodology & Biostatistics			
Course Code	BCVT6003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: This course deals with the study of Research Methodology & Biostatistics.

Course Outcomes

CO1	Students will be able to illustrate the basic principles of research.
CO2	Students will be able to interpret the research findings.
CO3	Students will be able to illustrate the basic of statistical methods.
CO4	Students will be able to illustrate the basic of biostatistics and research tools.
CO5	Help the students to apply research knowledge in presenting biological research.
CO6	Recent Trends in biostatistics.

Text Book (s):

1. The Analysis of Biological Data (2nd edition) by Whitlock & Schluter
2. TB of Biostatistics and Research methodology by Karthikeyan, R.M .Chaturvedi, R.M. Bhosale.

Reference Book (s):

1. Textbook of Methods in Biostatistics by B.K. Mahajan 7th Edition
2. Textbook of Biostatistics by B. Annadurai.

Unit-1 Introduction 8 hours
Introduction to research methods , Identifying research problem.
Unit-2 8 hours
Ethical issues in research, Research design.
Unit-3 8 hours
Basic Concepts of Biostatistics, Types of Data, Research tools and Data collection methods.
Unit-4 8 hours
Sampling methods, Probability rules & Probability distributions (Normal & Binomial).
Unit-5 8 hours
Developing a research proposal.
Unit-6 8 hours
Advances/Recent trends in biostatistics.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardiac Care Technician-II			
Course Code	BCCT6004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	8	0	0	8

Course Objectives: To get familiar with Cardiac Care Technology.

Course Outcomes

CO1	To analyze and interpret the principles of
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	ambulatory ECG, TMT and transesophageal echocardiography.
CO2	To analyze and interpret the principles of cardiac pacemakers.
CO3	To understand and analyze equipments used in the cardiac catheterization lab.
CO4	To understand difference between quality control and assurance.
CO5	Understand use and importance of records and consent. Understand abbreviations and symbols.
CO6	To understand pandemics and the role played by WHO in their management.

Text Book (s):

1. Cardiac Monitor Technician Textbook: Theory and Practical Fundamentals.
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.
3. Cardiac Monitor Technician Textbook: Theory and Hands On Approach By: Sultan, et al. Khan (Author), Faisal Khan MD.

Reference Book (s):

1. 1. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.
2. Cardiac Monitor Technician Textbook: Theory and Hands On Approach By: Sultan, et al. Khan (Author), Faisal Khan MD

Unit-1 Introduction 16hours
To understand about ambulatory ECG and it's significance, types of Ambulatory ECG. To understand how to prepare and position the patient for ECG. Understand proper placement of leads on chest wall for ECG. To understand the various complications associated with Exercise ECG Tread mill test To develop an understanding regarding treadmill test, different type of Stress TEST, procedure for carrying out stress Echo including the placement of leads during the test. To understand how to

prepare the patient for a cardiac stress echo, DSE, etc.

Understand various differences in the findings of a normal and an ischemic heart. To understand the working & procedure of an isotope stress test. To develop broad understanding regarding necessary precautions which to be taken while performing an isotope stress test.

To understand regarding Trans esophageal echocardiography, it's types, scope, indication for procedure & associated complications. To gain broad understanding regarding findings which is to be expected during the procedure. To understand the safety & privacy aspect of this procedure for the patient. To understand the roles and responsibilities of a technician during the procedure.

To understand to whom to contact in case if there is a need of replenishing supplies. To understand the /guidelines for medical and diagnostic supplies and content of the kit. To develop an understanding regarding need of maintaining record of supplies

Unit-2

16 hours

Introduction to Pacemaker & Leads

To gain understanding regarding the artificial pacemaker & temporary pacemakers, significance behind the implantation of an artificial pacemaker, cardioverter defibrillator and it's significance. To carry out initial assessment of patient before the implantation of a pace maker.

To understand factors which to be considered when the patient is on a pacemaker. To gain broad understanding regarding warning signs of pacemaker infection.

Role of CCT during Implant Of Temporary Pacemakers

To differentiate between artificial and temporary pacemaker implantation procedure. To understand regarding temporary trans venous pacing. To understand the common problems which may occur during the insertion of pacemaker, pace maker syndrome. To gain understanding regarding complications to be expected during the procedure.

To understand the significance of investigations which should be carried out pre and post implantation. To gain understanding regarding indication for a temporary pace making. To understand the significance of elective pace making. To understand procedure for applying an External pacemaker, common complication during implantation of temporary pacemaker, emergency measures which is to be taken in case of pacemaker failure

Unit-3

16 hours

Introduction to Cardiac Related Equipment

To enlist the commonly used cath lab equipment, Use of following equipment C arm & u arm. x ray tube. X ray detecting device.x ray switching and pulse controller. Digital image processor, Fluoroscopic imaging system,• Physiologic recorder, Contrast powder injector ray table. Crash cart and defibrillator. Intubation equipment, Central vein catheter, Cardiac drugs' Sterile equipment and supplies, Liquid cooling system, etc.To develop broad understanding regarding major equipment used in the cath lab setting and its operating methods, technical specification of common equipment in cath lab. Understand the regulatory framework for medical equipment.

To develop an understanding regarding Pericardiocentesis and its types.

To develop an understanding regarding Pericardiocentesis and it's types .To understand procedure for Pericardiocentesis and requisite equipment, indications and complications of needle peri-cardiocentesis, indications and complications of open pericardiocentesis. To understand role of a technician while carrying out the procedure.

Unit-4

16 hours

Understand the meaning of relations and types of relationship. To understand effective working relationships with the people external to the team, with which the individual works on a regular basis. To understand the effect of boundary violation in technician client relationships.

To understand the code of ethics for cardiac care technicians.

To understand the types of team in health care organization. To understand the elements and principles of team work and team based health care. Understand how to manage the conflict in health care facility management of work so as to meet professional expectations. To understand the significance of keeping the hospital clean. To understand the significance of maintaining confidentiality in work environment, managing stress.

Unit-5
16hours

Monitor And Assure Quality.

To understand the significance of quality, perception & its dimension, components of quality system, stages & elements quality system. Understand the process of quality system. To understand the significance of attending CME's for technician.

To develop a broad understanding regarding. (1) Hospital Information System. (2) Quality Improvement Plan. (3) Total Quality Management. To understand difference between quality control and assurance. To understand the factors which influences quality of care.

Consent, Documentation & Records.

Understand guidelines for documentation. Learn various types of records of importance for Cardiac Care Technician. Understand use and importance of records and consent. Understand abbreviations and symbols. Enter, transcribe, record, store, or maintain information in written or electronic/magnetic form.

Unit-6 Recent Trends
12 hours

Role of hospital in a pandemic.WHO and the role it plays in world health.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks

10	20	70	100
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Name of The Course	CARDIAC CATHETERIZATION LABORATORY BASICS (Practical)			
Course Code	BCVT6051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

To get familiar with Cardiac catheterization laboratory basics.

Course Outcomes

CO1	Students will be able to evaluate Fundamental principles of Aortic angiography, Coronary angioplasty, Balloon Mitral valvuloplasty etc.
CO2	Students will be able to evaluate Fundamental principles of Coronary angioplasty.
CO3	Students will be able to evaluate Fundamental principles of Aortic angiography, Balloon Mitral valvuloplasty etc.

Text Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins,
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.
3. Patrick Kay, Manel Sabate, Marco A. Costa Cardiac Catheterization and Percutaenous Interventions Taylor & Francis, 2004.
4. Echocardiography – Feigenbaum.

Reference Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume Lippincott Williams & Wilkins, 2005.

Unit-1 Introduction
Identify and evaluate the techniques used for cardiac catheterization.
Unit-2
Identify and evaluate the techniques used for angiography
Unit-3
Identify and evaluate the techniques used for cardiac intervention

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	CARDIAC CATHETERIZATION LABORATORY ADVANCED (Practical)			
Course Code	BCVT6052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: To get familiar with cardiac catheterization laboratory advanced.

Course Outcomes

CO1	Students will be able to evaluate Fundamental principles of Aortic angiography, Coronary angioplasty, Balloon Mitral valvuloplasty.
CO2	Students will be able to evaluate Fundamental principles of Coronary angioplasty.
CO3	Students will be able to evaluate Fundamental principles of Aortic angiography, Balloon Mitral valvuloplasty.

Text Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume 1 Lippincott Williams & Wilkins.
2. Morton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.
3. Patrick Kay, Manel Sabate, Marco A. Costa Cardiac Catheterization and Percutaenous Interventions Taylor & Francis, 2004.
4. Echocardiography – Feigenbaum

Reference Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume Lippincott Williams & Wilkins, 2005.

Unit-1 Introduction
Identify and evaluate the techniques used for cardiac catheterization.
Unit-2
Identify and evaluate the techniques used for angiography.
Unit-3
Identify and evaluate the techniques used for cardiac intervention.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Cardiac Care Technician-II (P)			
Course Code	BCCT6053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives: To get familiar with Cardiac Care Technology.

Course Outcomes

CO1	To understand the significance of various stress tests
CO2	To understand pacemakers.
CO3	To understand pericardiocentesis and hospital equipments
CO4	To understand the meaning of relations and types of relationship.
CO5	To understand documentation and consent

Text Book (s):

1. Cardiac Monitor Technician Textbook: Theory and Practical Fundamentals.
2. orton L. Kern, Morton J. Kern The Cardiac Catheterization Handbook Elsevier Health Sciences, 2011.
3. Patrick Kay, Manel Sabate, Marco A. Costa Cardiac Catheterization and Percutaenous Interventions Taylor & Francis, 2004.
4. Cardiac Monitor Technician Textbook: Theory and Hands On Approach By: Sultan, et al. Khan (Author), Faisal Khan MD.

Reference Book (s):

1. Donald S. Baim Grossman's Cardiac Catheterization, Angiography, and Intervention, Volume Lippincott Williams & Wilkins, 2005.

Unit-1 Introduction

To understand about ambulatory ECG and it's significance, types of Ambulatory ECG.

To understand how to prepare and position the patient for ECG. Understand proper placement of leads on chest wall for ECG. To understand the various complications associated with Exercise ECG

Tread mill test

To develop an understanding regarding treadmill test, different type of Stress TEST, procedure for carrying out stress Echo including the placement of leads during the test. To understand how to prepare the patient for a cardiac stress echo, DSE,

etc.

Understand various differences in the findings of a normal and an ischemic heart. To understand the working & procedure of an isotope stress test. To develop broad understanding regarding necessary precautions which to be taken while performing an isotope stress test.

To understand regarding Trans esophageal echocardiography, it's types, scope, indication for procedure & associated complications. To gain broad understanding regarding findings which is to be expected during the procedure. To understand the safety & privacy aspect of this procedure for the patient. To understand the roles and responsibilities of a technician during the procedure.

To understand to whom to contact in case if there is a need of replenishing supplies. To understand the guidelines for medical and diagnostic supplies and content of the kit. To develop an understanding regarding need of maintaining record of supplies

Unit-2

Introduction to Pacemaker & Leads

To gain understanding regarding the artificial pacemaker & temporary pacemakers, significance behind the implantation of an artificial pacemaker, cardioverter defibrillator and it's significance. To carry out initial assessment of patient before the implantation of a pace maker.

To understand factors which to be considered when the patient is on a pacemaker. To gain broad understanding regarding warning signs of pacemaker infection.

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To understand the significance of investigations which should be carried out pre and post

implantation. To gain understanding regarding indication for a temporary pace making. To understand the significance of elective pace making. To understand procedure for applying an External pacemaker, common complication during implantation of temporary pacemaker, emergency measures which is to be taken in case of pacemaker failure

Unit-3

Introduction to Cardiac Related Equipment

To enlist the commonly used cath lab equipment, Use of following equipment C arm & u arm. x ray tube. X ray detecting device.x ray switching and pulse controller. Digital image processor, Fluoroscopic imaging system,• Physiologic recorder, Contrast powder injector ray table. Crash cart and defibrillator. Intubation equipment, Central vein catheter, Cardiac drugs' Sterile equipment and supplies, Liquid cooling system, etc.To develop broad understanding regarding major equipment used in the cath lab setting and its operating methods, technical specification of common equipment in cath lab. Understand the regulatory framework for medical equipment.

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Unit-4

Understand the meaning of relations and types of relationship. To understand effective working relationships with the people external to the team, with which the individual works on a regular basis. To understand the effect of boundary violation in technician client relationships.

To understand the code of ethics for cardiac care technicians.

To understand the types of team in health care organization. To understand the elements and

principles of team work and team based health care. Understand how to manage the conflict in health care facility management of work so as to meet professional expectations. To understand the significance of keeping the hospital clean. To understand the significance of maintaining confidentiality in work environment, managing stress.

Unit-5

Monitor And Assure Quality.

To understand the significance of quality, perception & its dimension, components of quality system, stages & elements quality system. Understand the process of quality system. To understand the significance of attending CME's for technician.

To develop a broad understanding regarding. (1) Hospital Information System. (2) Quality Improvement Plan. (3) Total Quality Management. To understand difference between quality control and assurance. To understand the factors which influences quality of care.

Consent, Documentation & Records.

Understand guidelines for documentation. Learn various types of records of importance for Cardiac Care Technician. Understand use and importance of records and consent. Understand abbreviations and symbols. Enter, transcribe, record, store, or maintain information in written or electronic/magnetic form.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

COURSE BOOK - 2020

Volume-01



**Curriculum and Syllabus
2020-2021**

**Bachelor of Optometry
School of Medical and Allied Science**

Vision

- **To be recognized globally as a premier department of Optometry for imparting value-based education involving interdisciplinary research and innovation.**

Mission

- **M1 Establish state of art facilities for excellence in the field of Optometry and interdisciplinary research and innovation.**
- **M2 Collaborate with health care professionals to prepare curriculum with strong foundation for Optometry.**
- **M3 Involve students in community optometry and eye health programmes to develop patient care.**

Program Educational Objectives

Optometry graduates shall

- **PEO 1:- Engage in experiential entrepreneurship opportunities.**
- **PEO 2:- Collaborate with other health care professionals to serve and do patient care.**
- **PEO 3:- Pursue higher studies in an institution of repute.**

Program Specific Objectives

Not Applicable

Program Outcomes

PO-1 Clinical Care (Optometry Practice and Clinical Care)

Clinical Care (Optometry Practice and Clinical Care) stand for understanding and using principles of basic sciences and assessing their impact on patients. It guides us how to do patient's examination and care.

PO-2 Communication

Communication is an interpersonal skill by which person interact with others. Optometrist have to interact with patient their care provider and other health care professionals. He should know how to do oral & written communication and maintain good relationship.

PO-3 Membership of a multidisciplinary health team

Membership of a multidisciplinary health team is like working in a team for providing best possible patient care and other team objectives.

PO-4 Ethics and accountability

Ethics and accountability refer to moral values and laws relevant in field of Optometry.

PO-5 Commitment to Professional excellence

Commitment to Professional excellence refers to commitment to quality care in field of Optometry.

PO-6 Leadership skill and mentorship

Leadership skill and mentorship refers to taking initiatives working in a team and leading to for better overall results.

PO-7 Social Responsibility

Social Responsibility refers to understanding it and serving community by providing best possible patient care.

PO-8 Scientific attitude and scholarship

Scientific attitude and scholarship refers to using their principle and doing research in Optometry.

PO-9 Lifelong learning

Lifelong learning refers to continuous improvement of Optometry skills.

Course Curriculum

Semester I

Sl. No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BOPT1001	General Anatomy	3	0	0	3	10	20	70
2	BOPT1002	General Physiology	3	0	0	3	10	20	70
3	BOPT1004	Geometrical Optics-1	3	0	0	3	10	20	70
4	BOPT1005	Nutrition	2	0	0	2	10	20	70
5	BOPT1006	General Biochemistry	2	0	0	2	10	20	70
6	BLLUCT1001	Functional English-I(Professional Communication – BEC 1)	0	0	6	3	10	20	70
7	BCEUCT1002	Waste Management Course	1	0	0	1	10	20	70
8	BLEUCT1002	Liberal Arts	0	0	1	0.5	10	20	70
9	BOPT1051	General Anatomy Lab	0	0	2	1	10	20	70
10	BOPT1052	General Physiology Lab	0	0	2	1	10	20	70
11	BOPT1053	Basic & Ocular Biochemistry Lab	0	0	2	1	10	20	70
12	BOPT1054	Geometrical Optics Lab-1	0	0	2	1	10	20	70
13	FENG1002	Functional English Lab-I	0	0	2	1	10	20	70
		Total	14		17	23.5			

Semester II									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BOPT2001	Ocular Anatomy	3	0	0	3	10	20	70
2	BOPT2002	Ocular Physiology	3	0	0	3	10	20	70
3	BOPT2003	Physical Optics	3	0	0	3	10	20	70
		ELECTIVES(Theory)							
4	BOPT2004	Infection control measures	2	0	0	2	10	20	70
5	BOPT2005	Operation theatre Management	2	0	0	2	10	20	70
6	BOPT2006	Hospital Waste Management	2	0	0	2	10	20	70
7	BOPT2007	Geometrical Optics-II	3	0	0	3	10	20	70
8	BOPT2008	Ocular Biochemistry	2	0	0	2	10	20	70
9	BLLUCT1002	Functional English-II(Professional Communication – BEC 2)	0	0	6	3	10	20	70
10	BOPT2051	Ocular Anatomy Lab	0	0	2	1	10	20	70
11	BOPT2052	Ocular Physiology Lab	0	0	2	1	10	20	70
12	BOPT2053	Physical optics Lab	0	0	2	1	10	20	70
13	BOPT2054	Geometrical Optics Lab-II	0	0	2	1	10	20	70
14	BOPT2055	Ocular Biochemistry Lab	0	0	2	1	10	20	70
15	BOPT2056	Clinical Optometry	0	0	2	1	10	20	70
16	FENG1004	Functional English Lab-II	0	0	2	1	10	20	70
17	BCEUCT1001	Environmental Sciences	0	0	1	0.5	10	20	70
		Total	16		21	26.5			

Semester III									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BOPT3001	Ocular Microbiology	2	0	0	2	10	20	70
2	BOPT3002	Visual Optics-I	2	0	0	2	10	20	70
3	BOPT3003	Optometric Optics-I	3	0	0	3	10	20	70
4	BOPT3004	Optometric Instruments	2	0	0	2	10	20	70
5	BOPT3005	Ocular Disease-1	3	0	0	3	10	20	70
6	BOPT3006	Clinical Examination of Visual system	2	0	0	2	10	20	70
7	BOPT3007	Indian Medicine & Telemedicine	2	0	0	2	10	20	70
8	COMP1111	Computer Fundamentals (B.C & I.S)	3	0	0	3	10	20	70
9	BCSUCT1001	AI & ML	0	0	4	2	10	20	70
10	BLEUCT1001	Foreign Language	2	0	0	2	10	20	70
11	BOPT3054	Clinical Optometry-II(VO Lab-I)	0	0	2	1	10	20	70
12	BOPT3055	Clinical Optometry-II(OI Lab-I)	0	0	2	1	10	20	70
13	BOPT3056	Clinical Optometry-II(OD Lab-I)	0	0	2	1	10	20	70
14	COMP1112	Computer Fundamentals Lab (Excel & PPT Training)	0	0	2	1	10	20	70
		Total	21		12	27			

Semester IV									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BOPT4001	Optometric Optics-II & Dispensing Optics	3	0	0	3	10	20	70
2	BOPT4002	Visual optics-II	2	0	0	2	10	20	70
3	BOPT4004	Pathology	2	0	0	2	10	20	70
4	BOPT4005	Basic & Ocular Pharmacology	3	0	0	3	10	20	70
5	BOPT4008	Health care organization	2	0	0	2	10	20	70
6	BOPT4010	Ocular Disease-II and Glaucoma	3	0	0	3	10	20	70
7	BOPT4011	Introduction to Quality & Patient safety	2	0	0	2	10	20	70
8	BOPT4012	Medical Psychology	2	0	0	2	10	20	70
9	BOPT4054	Basic & Ocular Pharmacology Lab	0	0	2	1	10	20	70
10	BOPT4055	Clinical Optometry-III(OO & DO Lab)	0	0	2	1	10	20	70
11	BOPT4056	Clinical Optometry-III(VO Lab-II)	0	0	2	1	10	20	70
12	BOPT4057	Clinical Optometry-III(OD Lab-II)	0	0	2	1	10	20	70
		Total	19		8	23			

Semester V									
Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1.	BOPT5001	Contact lens-I	2	0	0	2	10	20	70
2.	BOPT5002	Low Vision Care	2	0	0	2	10	20	70
3.	BOPT5003	Geriatric & Pediatric Optometry	3	0	0	3	10	20	70
4.	BOPT5004	Binocular Vision-I	2	0	0	2	10	20	70
5.	BOPT5005	Systemic Disease	3	0	0	3	10	20	70
6.	BOPT5006	Research Methodology & Biostatistics	2	0	0	2	10	20	70
7.	UHVE1001	Universal human Values & Ethics	3	0	0	3	50		50
8.	BOVT5008	Vision Technician-I	3	0	0	3	10	20	70
9	BLLUCT1003	Campus to Corporate	3	0	0	3	10	20	70
10	BOPT5051	Contact lens Lab-I	0	0	2	1	10	20	70
11	BOPT5052	Low Vision Care Lab	0	0	2	1	10	20	70
12	BOPT5055	Clinical Optometry-IV(BV Lab-I)	0	0	2	1	10	20	70
13	BOVT5056	Clinical Optometry-IV(VT Lab-I)	0	0	4	2	10	20	70
		Total	23		10	28			

Semester VI									
Sl No	Course Code	Name of the Course	Assessment Pattern						
			L	T	P	C	IA	MTE	ETE
1.	BOPT6001	Contact lens-II	3	0	0	3	10	20	70
2.	BOPT6002	Binocular Vision -II	3	0	0	3	10	20	70
3.	BOPT6003	Public Health & Community Optometry	2	0	0	2	10	20	70
4	BOPT6005	Occupational Optometry	2	0	0	2	10	20	70
5	BOVT6010	Vision Technician-II	3	0	0	3	10	20	70
6	BOPT6011	Practice Management	2	0	0	2	10	20	70
7	BOPT6012	Medical Law & Ethics	2	0	0	2	10	20	70
8	BLEUCT1003	Creativity, Innovation and Entrepreneurship & IPR	1	0	0	1	10	20	70
9	BOPT6051	Contact lens Lab-II	0	0	2	1	10	20	70
10	BOPT6052	Binocular Vision Lab-II	0	0	2	1	10	20	70
11	BOVT6056	Clinical Optometry-V(VT Lab-II)	0	0	4	2	10	20	70
12	BOPT6057	Clinical Optometry-V	0	0	2	1	10	20	70
		<u>Research Project-I</u>							
13	BOPT6053	Contact lens	0	0	4	2	30		70
14	BOPT6054	Binocular Vision	0	0	4	2	30		70
15	BOPT6055	Optometric Instruments	0	0	4	2	30		70
16	BOP6056	General Optometry	0	0	4	2	30		70
		Total	18	0	14	25			

Detailed Syllabus

Name of The Course	General Anatomy-I			
Course Code	BOPT1001			
Prerequisite				
Corequisite				
Ant requisite				
	L	T	P	C
	3	0	0	3

Course Objective: At the end of the semester, the student should be able to:

1. Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the human body.
2. Identify the microscopic structures of various tissues, and organs in the human body and correlate the structure with the functions.
3. Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyze the integrative and regulative functions on the organs and systems.

Course Outcomes:

CO1	To identify and describe the structure of various systems of the Human Body- especially Musculo-skeletal system, Cardio-vascular system.
CO2	To identify and palpate the various joints, muscles, nerves and other soft tissues of the upper and lower extremities and the organs in the thoracic cavity.
CO3	To be able to apply the knowledge for the assessment of pathological conditions (orthopedic conditions,) and differentiation of normal anatomical structure from the pathological conditions.
CO4	To be able to apply the knowledge for the assessment of pathological conditions (Neurological conditions, cardio-vascular conditions) and differentiation of normal anatomical structure from the pathological conditions.
CO5	To be able to apply the knowledge for the assessment of pathological conditions (cardio-vascular conditions) and differentiation of normal anatomical structure from the pathological conditions.
CO6	To be able to apply the knowledge about recent advancement in General Anatomy

TEXT BOOKS:-

1. MARIANO S.H. DIFIIORE: Atlas of Human Histology, 5th Ed. 1981, Lea and Feliger.
2. G.J. TORTORA & N.P ANAGNOSTAKOS: Principles of Anatomy and Physiology. (recent edition)
3. B.D. CHAURASIA: Handbook of General Anatomy, 2nd Ed., CBS Publishers and

Distributors, New Delhi - 110 032.

REFERENCE BOOKS:-

1. PETER L. WILLIAMS AND ROGER WARWICK: - Gray's Anatomy - Descriptive and Applied, 36th Ed., 1980, Churchill Livingstone.
2. T.S. RANGANATHAN: Text book of Human Anatomy, 1982, S. Chand & Co., New Delhi 110 055.
3. INDERBIR SINGH: Human Embryology, 3rd Ed., Macmillan India, 1981.
4. R. KANAGASUNTHARAM, P. SIVANANDA-SINGHAM & A. KRISHNAMURTI: Anatomy- Regional, Functional, & Clinical, P.G. Publisher, Singapore 1987.

Course Content

Unit I	8 Hrs
Introduction to Human Anatomy: Anatomy: Definition and its relevance in medicine and optometry Planes of the body, relationship of structures, organ system	
Skeleton System	
Unit II	8 Hrs
Tissues of the Body: Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues.	
Muscles: Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply	
Unit III	8 Hrs
Blood vessels: Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations	
Skin and appendages: Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves	
Unit IV	8 Hrs
Lymphatic system: Embryology, functions, relationship with blood vessels and organs	
Glands: Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands	
Unit V	8 Hrs
Nervous system: Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system	
Brain and Cranial nerves: Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves	
Unit VI	8 Hrs
Advancements in General Anatomy	
Anatomy and its impact on medicine	
Recent Advances in the Study and Techniques of Anatomy	
New Discoveries in Human Anatomy	

COURSE PLAN:

Sl. No.	Topics	No. of hrs.
1	Introduction to Human Anatomy: Anatomy: Definition and its relevance in medicine and optometry Planes of the body, relationship of structures, organ system	1
2	Skeleton System	3
3	Tissues of the Body: Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in	3

Sl. No.	Topics	No. of hrs.
	different tissues	
4	Muscles: Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply	3
5	Blood vessels: Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations	3
6	Skin and appendages: Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves	3
7	Lymphatic system: Embryology, functions, relationship with blood vessels and organs	1
8	Glands: Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands	2
9	Nervous system: Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system	5
10	Brain and Cranial nerves: Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves	6
Total Number of Hours		30

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	General Physiology-I			
Course Code	BOPT1002			
Prerequisite				
Corequisite				
Anti requisite				
	L	T	P	C
	3	0	0	3

Course Objective: At the end of the course the student will be able to:

- Explain the normal functioning of various organ systems of the body and their interactions.
- Elucidate the physiological aspects of normal growth and development.
- Describe the physiological response and adaptations to environmental stresses.
- Know the physiological principles underlying pathogenesis of disease.

Course Outcomes:

At the end of the course, students will be able to:

CO1	On completion of this course, the students will be able to understand-scope and importance of cell,
CO2	On completion of this course, the students will be able to understand-scope and importance of cell physiological laws
CO3	On completion of this course, the students will be able to understand-scope and importance of blood groups.
CO4	On completion of this course, the students will be able to understand-scope and importance of blood transfusion.
CO5	On completion of this course, the students will be able to understand-scope and importance of fundamentals of different organ systems.
CO6	To be able to apply the knowledge about recent advancement in General Physiology

TEXT BOOKS:-

1. L Prakasamreddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad,2008
2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008

REFERENCE BOOKS:-

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition,CBS Publishers, New Delhi,2006
2. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company,Japan,
3. G J Tortora, B Derrickson: Principles of anatomy & physiology,11th edition, Harper & Row Publishers, NewYork
4. John Wiley & Sons Inc, New Jersey,2007

Course Content

Unit I Cell Definition, Structure and function of Cytoplasmic Organelles, Reproduction-Meosis, Mitosis.	8 Hrs
Unit II The important physico-chemical laws applied to physiology, Diffusion, Osmosis, Bonding, Filtration, Dialysis, Surface Tension, Adsorption, Colloid.	8 Hrs
Unit III Introduction- composition and function of blood, Red blood cells- Erythropoiesis, stages of differentiation function, counts physiological Variation. Haemoglobin -Structure, function, concentration physiological variation. Methods of Estimation of Hb, White blood cell- Production, function, life span, count, differential count. Platelets- Origin, normal count, morphology functions. Plasma Proteins- Production, concentration, types, albumin, globulin, fibrinogen, Prothrombin functions. Hemostasis & Blood coagulation. Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting disorders of clotting factors. Blood Bank, Blood groups-A, B, O system, Rh system,	8 Hrs
Unit IV Circulation: General principles Heart: myocardium – innervation – transmission of cardiac impulse. Events during cardiac cycle – cardiac output. Peripheral circulation: peripheral resistances – arterial blood pressure – measurements – factors regulation variations – capillary circulation – venous circulation. Special circulation: coronary cerebral – miscellaneous.	8 Hrs
Unit V Respiration: Mechanics of respiration – pulmonary function tests – transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea – asphyxia. Excretion: Body fluids – distribution, measurement & exchange, Kidney – structure of nephron – mechanism of urine formation – composition of the urine and abnormal constituents – urinary bladder & micturition	8 Hrs
Unit VI Recent advances in the field of Physiology Recent studies going on in general biology, Review of different articles	8 Hrs

COURSE PLAN:

Sl. No.	Topics	No. of hrs.
1	CELL STRUCTURE & ORGANIZATION Tissue organization Epithelium Connective tissue –Collagen fibers –Elastic fibers –Areolar fibers Cartilage –Bone Contractile tissue –striated –skeletal –cardiac –non striated –plain –myoepithelial General principles of cell physiology Physiology of skeletal muscle	4
2	BLOOD: Composition Volume measurement & variations Plasma proteins –classification & functions Red blood cells –development, morphology & measurements –functions & dysfunctions. White blood cells –development –classification, morphology –functions & dysfunctions Platelets –morphology –development, functions & dysfunctions Clotting –factors – mechanism –anti- coagulants dysfunctions Blood grouping –classification –importance in transfusion, Rh factor & incompatibility Suspension stability Osmotic stability Reticulo endothelial system Spleen lymphatic tissue Thymus bonemarrow immune system cellular Humoral Autoimmune	4
3	DIGESTION: General arrangement Salivary digestion –functions & regulations Gastric digestion –functions & regulations Pancreatic digestion –functions & regulations Intestinal digestion –functions & regulations Liver & bile Absorption Motility Deglutition Vomiting Defecation Functions of large intestine Neurohumoral regulations of alimentary functions, summary	2
4	EXCRETION: Body fluids –distribution, measurement & exchange, Kidney –structure of nephron –mechanism of urine formation –composition of the urine and abnormal constituents –urinary bladder & micturition	2
5	ENDOCRINES: Hormone mechanism –negative feed backs –tropic action –permissive action – cellular action, hypothalamic regulation Thyroid - hormones, actions, regulations Adrenal cortex - hormones, actions, regulations Adrenal medulla –hormones, actions, regulations Parathyroid - hormones, actions, regulations Islets of pancreas –hormones, actions, regulations Miscellaneous _ hormones, actions,regulations Common clinical disorders	3

6	REPRODUCTION: Male reproductive system –control & regulation Female reproductive system –uterus –ovaries –menstrual cycle –regulation – pregnancy & delivery –breast –family planning	1
7	RESPIRATION: Mechanics of respiration –pulmonary function tests –transport of respiratory gases- neural and chemical regulation of respiration –hypoxia, cyanosis, dyspnea– asphyxia.	1
8	CIRCULATION: General principles Heart: myocardium –innervation –transmission of cardiac impulse- Events during cardiac cycle –cardiac output. Peripheral circulation: peripheral resistances –arterial blood pressure – measurements –factors regulation variations –capillary circulation – venous circulation. Special circulation: coronary cerebral –miscellaneous	4
9	ENVIRONMENTAL PHYSIOLOGY Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure	2
10	NERVOUS SYSTEM: Neuron –Conduction of impulse –synapse –receptor. Sensory organization –pathways and perception Reflexes –cerebral cortex –functions. Thalamus –Basal ganglia Cerebellum. Hypothalamus. Autonomic nervous system –motor control of movements, posture and equilibrium – conditioned reflex, eye hand co-ordination	5
11	SPECIAL SENSES –(Elementary) Olfaction –Taste –Hearing	2
	Total Number of Hours	30

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Geometrical Optics-I			
Course Code	BOPT1004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives

The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

Course Outcomes

At the end of the course, students will be able to:

CO1	To understand about the light behaviour and its propagation in a variety of media
CO2	Phenomenon of reflection and refraction of light at boundaries between media and subsequent image formation
CO3	Reflections at plane and spherical surfaces and refractions at plane
CO4	Spherical, cylindrical and toric surfaces will be studied in this course
CO5	Surfaces, lenses and their imaging properties
CO6	To be able to apply the knowledge about recent advancement in Geometrical Optics

TEXT BOOK:

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
2. . Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 98.

REFERENCE BOOKS:

1. Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
2. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

Course Content

. Nature of light	8 hours
Nature of light –light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index.	
2. Wavefronts–spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance	
3. Refractive index; its dependence on wavelength	
4. Fermat's and Huygen's Principle –Derivation of laws of reflection and refraction (Snell's law) from these principles	
5. Plane mirrors –height of the mirror; rotation of the mirror	
6. Reflection by a spherical mirror –paraxial approximation; sign convention; derivation of vergence equation	
7. Imaging by concave mirror, convex mirror	
8. Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface	
Unit II: Glass	8 hours
9 Glass slab; displacement without deviation; displacement without dispersion	
10. Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism	
11. Prisms; angular dispersion; dispersive power; Abbe's number.	
12. Definition of crown and flint glasses; materials of high refractive index	
13. Thin prism –definition; definition of Prism diopter; deviation produced by a thin prism; it dependence on refractive index	
14. Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula	
15. Paraxial approximation; derivation of vergence equation	
16. Imaging by a positive powered surface and negative powered surface	
.	
Unit III: Vergence	8 hours
17. Vergence at a distance formula; effectivity of a refracting surface	
18. Definition of a lens as a combination of two surfaces; different types of lens shapes.	
19. Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths	
20. Newton's formula; linear magnification; angular magnification	
21. Nodal Planes.	
22. Thin lens as a special case of thick lens; review of sign convention	
23. Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	
24. Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	
Unit IV : Prentice's Rule	8 hours

. Prentice's Rule

26. System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points.

27. System of more than two thin lenses; calculation of equivalent power using magnification formula

28. Vergence and vergence techniques revised.

29. Gullstrand's schematic eyes, visual acuity, Stile Crawford

30. Emmetropia and ametropia

31. Blur retinal Imaginary

32. Correction of spherical ametropia, vertex distance and effective power, dioptric power of the spectacle, to calculate the dioptric power, angular magnification of spectacles in aphakic

.

Unit V: Thin lens model of the eye

8 hours

33. Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification.

34. Aperture stops- entrance and exit pupils.

35. Astigmatism. - To calculate the position of the line image in a spherocylindrical lens.

36. Accommodation –Accommodation formulae and calculations.

37. Presbyopia- Spectacle magnification, angular magnification of spectacle lens, near point, calculation of add, depth of field.

38. Spatial distribution of optical information- modulation transfer functions- Spatial filtering- applications.

39. Visual optics of aphakia and pseudophakia.

Unit 6: Recent Advancements in Geometrical Optics

Femtosecond Optics

High-Intensity Laser-Matter Interactions

Advanced Materials for the Generation and Control of Light

Materials for Shaping and Focusing Optical Radiation

COURSE PLAN

No.	Topics	No of hrs.
1.	Nature of light –light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index.	2
2.	Wavefronts–spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance	2
3.	Refractive index; its dependence on wavelength	1
4.	Fermat's and Huygen's Principle –Derivation of laws of reflection and refraction (Snell's law) from these principles	3
5.	Plane mirrors –height of the mirror; rotation of the mirror	1
6.	Reflection by a spherical mirror –paraxial approximation; sign convention; derivation of vergence equation	1
7.	Imaging by concave mirror, convex mirror	2
8.	Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface	2
9.	Glass slab; displacement without deviation; displacement without dispersion	2
10.	Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism	2
11.	Prisms; angular dispersion; dispersive power; Abbe's number.	1
12.	Definition of crown and flint glasses; materials of high refractive index	1
13.	Thin prism –definition; definition of Prism diopter; deviation produced by a thin prism; its dependence on refractive index	2
14.	Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula	3
15.	Paraxial approximation; derivation of vergence equation	1
16.	Imaging by a positive powered surface and negative powered surface	1
17.	Vergence at a distance formula; effectivity of a refracting surface	1
18.	Definition of a lens as a combination of two surfaces; different types of lens shapes.	1
19.	Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths	3
20.	Newton's formula; linear magnification; angular magnification	2
21.	Nodal Planes	1
22.	Thin lens as a special case of thick lens; review of sign convention	1
23.	Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	2
24.	Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	2
25.	Prentice's Rule	1
26.	System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points.	2
27.	System of more than two thin lenses; calculation of equivalent power using magnification formula	2
	Total number of Lectures	45

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Nutrition			
Course Code	BOPT1005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives

At the end of the course student would have gained the knowledge of the following:

- **Balanced diet.**
- **Protein, carbohydrates, vitamins, Minerals, carotenoids and eye.**
- **Nutrition and Ocular aging**
- **Adverse effects of ocular nutritional supplements.**

Course Outcomes

At the end of the course, students will be able to:

CO1	To understand the knowledge on Balanced diet
CO2	To have an understanding on the requirement of protein, carbohydrates, vitamins in the body
CO3	To have an idea on the process of aging and vital requirements for that
CO4	To have an understanding on the adverse affects on ocular nutritional supplements
CO5	To have an correlation on the systemic requirements and ocular requirements

TEXT BOOK:

1. M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore, 2004
2. C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, 2004
3. Frank Eperjesi & Stephen Beatty: Nutrition and the Eye A practical Approach, Elsevier Butterworth-Heinemann, USA, 2006

Reference Books

1. Mukesh Singhal and Niranjana G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.

Course Content

Introduction History of Nutrition Nutrition as a science Food groups, RDA Balanced diet, diet planning. Assessment of nutritional status	8 hours
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<p>Energy Units of energy. Measurements of energy and value of food Energy expenditure. Total energy/calorie requirement for different age groups and diseases. Satiety value Energy imbalance- obesity, starvation. Limitations of the daily food guide.</p>	
<p>Unit II: Protein Sources and functions Essential and non- essential amino- acids. Incomplete and complete proteins Supplementary foods. PEM and the eye Nitrogen balance Changes in protein requirement.</p>	8 hours
<p>Unit III: Fat Fats Sources and functions Essential fatty acids Excess and deficiency Lipids and the eye. Hyperlipidemia, heart diseases, atherosclerosis. Minerals General functions and sources Macro and micro minerals associated with the eye. Deficiencies and excess –ophthalmic complications (e.g. iron, calcium, iodine etc.)</p>	8 hours
<p>Unit IV : Vitamin Vitamins General functions, and food sources Vitamin deficiencies and associated eye disorders with particular emphasis to Vitamin A Promoting sound habits in pregnancy, lactation and infancy. Nutrient with antioxidant. Properties Digestion of Proteins, carbohydrates & lipids .</p>	8 hours
<p>Unit V: Miscellaneous Nutritional Diseases Miscellaneous Nutritional Diseases Measles and associated eye disorders, low birth weight</p>	8 hours
<p>UnitVI: Recent Advancements in Nutrition 8 hours Recent advancements in Nutrition Recent advancements in Diet planning for various categories of people Literature review U tube videos Presentations</p>	

COURSE PLAN (Total: 15 hours)

1. Introduction.
 - 1.1 History of Nutrition
 - 1.2 Nutrition as a science
 - 1.3 Food groups, RDA
 - 1.4 Balanced diet, diet planning.
 - 1.5 Assessment of nutritional status
2. Energy
 - 2.1 Units of energy.
 - 2.2 Measurements of energy and value of food
 - 2.3 Energy expenditure.
 - 2.4 Total energy/calorie requirement for different age groups and diseases.
 - 2.5 Satiety value
 - 2.6 Energy imbalance- obesity, starvation.
 - 2.7 Limitations of the daily food guide.
3. Proteins
 - 3.1 Sources and functions
 - 3.2 Essential and non- essential amino- acids.
 - 3.3 Incomplete and complete proteins
 - 3.4 Supplementary foods.
 - 3.5 PEM and the eye
 - 3.6 Nitrogen balance
 - 3.7 Changes in protein requirement.
4. Fats
 - 4.1 Sources and functions
 - 4.2 Essential fatty acids
 - 4.3 Excess and deficiency
 - 4.4 Lipids and the eye.
 - 4.5 Hyperlipidemia, heart diseases, atherosclerosis.
5. Minerals
 - 5.1 General functions and sources
 - 5.2 Macro and micro minerals associated with the eye.
 - 5.3 Deficiencies and excess –ophthalmic complications (e.g. iron, calcium, iodine etc.)
6. Vitamins
 - 6.1 General functions, and food sources
 - 6.2 Vitamin deficiencies and associated eye disorders with particular emphasis to Vitamin A
 - 6.3 Promoting sound habits in pregnancy, lactation and infancy.
 - 6.4 Nutrient with antioxidant.
 - 6.5 Properties
 - 6.6 Digestion of Proteins, carbohydrates & lipids
7. Essential amino acids.
8. Miscellaneous
 - 8.1 Measles and associated eye disorders, low birth weight

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	GENERAL BIOCHEMISTRY			
Course Code	BOPT1006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives At the end of the course, the student should be able to: demonstrate his knowledge and understanding on:

1. Structure, function and interrelationship of biomolecules and consequences of deviation from normal.
2. Integration of the various aspects of metabolism, and their regulatory pathways.
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data.

Course Outcomes

At the end of the course, students will be able to:

CO1	On completion of this course, the students will be able to understand Structure, function and interrelationship of biomolecules
CO2	On completion of this course, the students will be able to understand consequences of deviation from normal
CO3	On completion of this course, the students will be able to understand. Integration of the various aspects of metabolism, and their regulatory pathways
CO4	On completion of this course, the students will be able to understand Principles of various conventional and specialized laboratory investigations
CO5	On completion of this course, the students will be able to understand analysis and interpretation of a given data.
CO6	To be able to apply the knowledge about recent advancement in General Biochemistry

TEXT BOOK: S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

REFERENCE BOOKS:

- S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
- D.R. Whikehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

Course Content

Unit I Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)	8 Hrs
Unit II Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)	8 Hrs
Unit III Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane	8 Hrs
Unit IV Vitamins: General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties)	8 Hrs
Unit V Minerals: Na, K, Ca, P, Fe, Cu and Se(requirements, availability and properties) Mode of Evaluation: The theory and lab performance of students are evaluated separately	8 Hrs

COURSE PLAN

Sl.No.	Topics	No of hrs
1	Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)	6
2	Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)	6
3	Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane	6
4	Vitamins: General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties)	6
5	Minerals: Na, K, Ca, P, Fe, Cu and Se.(requirements, availability and properties)	6
	Total Number of Hours	30

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Waste Management Course			
Course Code				
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	1	0	0	0.5

Course Objective:

The objective of the course is to:

To describe waste, segregation and categorization and management of disposal of waste. waste that contains unused materials and potentially risk from them.

This definition includes waste generated by various sources like domestic waste, industrial waste, nuclear waste & health care waste. Healthcare facilities like physician's offices, hospitals, dental practices, laboratories, medical research facilities, and veterinary clinics.

Course Outcomes

At the end of the course, students will be able to:

CO1	Know about Hospital Waste management
CO2	Know about Role of Legislation, policies and law
CO3	Know about Basic steps in Health Care Waste Management Segregation
CO4	Know about handling of waste & Infection control
CO5	Know about Disposal Technologies:
CO6	To be able to apply the knowledge about recent advancement in Waste Management

Text Books

- 1 Text Book of Preventive and Social Medicine by [Piyush Gupta](#)
- 2 Community Medicine with Recent Advances: A. H. Suryakantha
- .3 **Fluke C. Handling hazardous waste. J ... hospital.Pak J Med Res 2001;40:13-17. 3. Ather S**

Course Content

Unit I Introduction of Waste	8 hours
Introduction, definition of general and hazardous health care waste and diseases. Infectious waste, genotoxic waste, waste sharps, biomedical waste categories categorization and composition of Biomedical waste. Specification of materials. Color coding. Sources of Health care wastes, Hospitals and health care establishments & other sources. Specifically Communicable diseases.	
Unit II: Legislation, policies and law	8 hours

Legislation, policies and law regarding environment on Health care waste management. Biomedical waste management and handling rules, 1998 and its amendment there after.CPCB guidelines. (Central pollution control board)Some idea on safe disposal of Radioactive waste rules,1995 guideline of BARC

Unit III: Basic steps in Health Care Waste Management Segregation

8 hours

Basic steps in Health Care Waste Management Segregation at the point of generation sharp Decontaminating/Disinfections unit on container for autoclaving Sharp waste containers for storage and transportation autoclaving/ shredding /incrimination /bio hazard symbols. Microwave, Hydropulbing, plasma torch.

10Unit IV Handling of waste & Infection control 8 hours

Collection & Handling of waste. Infection control system in hospital. Needle sticks injury and other sharp injury and hospital policy for protection of health care workers. On site Pre-treatment of waste. Conventional Treatment Technologies a)Wet thermal technology b) Incineration-different models Alternative Treatment Technologies Microwave Technology Rotaclave system, Hydro clave system Electro Thermal Reactivation(ETP), Treatment Process Electron beam Technology, Plasma Pyrolysis/Gasificaton systems.

Unit VDisposal Technologies

8 hours

Sharp disposal pit (b) Deep-burial pit (c) Secured land fill.

Waste Minimization Recycling. Re-use.

Health & safety Practices. Usage of protective equipment Occupational health programmers & safety practices Emergency measures.

Management of non-clinical support devices pretreatment of linen, laundry, cental sterilization unit(CSSD)

Unit VI Environmental Pollution

Definition

Cause, effects and control measures of:

Air pollution

Water pollution

Soil pollution

Marine pollution

Noise pollution

Thermal pollution

Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and Industrial wastes.

Role of an individual in prevention of pollution.

Pollution case studies.

Disaster management: floods, earthquake, cyclone and landslides

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Functional English-I			
Course Code	FENG1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective:

The objective of the course is to:

1. This course trains the students in oral presentations, expository writing, logical organization and structural support.
2. By acquiring skills in the use of communication techniques the students will be able to express better, grow personally and professionally, develop poise and confidence and achieve success
 - Understand simple texts and a range of high frequency vocabulary in context
 - Describe aspects of personal and everyday life in both oral and written form
 - Produce short and simple connected texts on familiar topics
 - Basic understanding into pronunciation of English sounds

Course Outcomes

At the end of the course, students will be able to:

CO1	Develop the understanding into the communication and language as its medium
CO2	Develop the basic understanding of spoken English
CO3	Improve their reading fluency skills through extensive reading
CO4	Use and assess information from academic sources, distinguishing between main ideas and details
CO5	Compare and use a range official support through formal and informal writings
CO6	To be able to apply the knowledge about recent advancement in Functional English

Text Books

1. Course Title: Better Spoken English by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KokQCOElxcDQrs>
2. Course Title: Understanding Creativity and Creative Writing by Prof. Neelima Talwar(NPTEL)
<http://www.digimat.in/nptel/courses/video/109101017/L01.html>
1. Graham Lock, Functional English Grammar: Introduction to second Language Teachers. Cambridge University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts, practice and evidence, Jones & Bartlett Publications , USA, 2009

Reference Books

3. Course Title: Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)
https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH
4. Course Title: English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>

Course Content

<p>Unit I: Communication 8 hours</p> <p>Communication: Definition, Types (Verbal and Non-verbal), Models, Language as a tool of communication The flow of Communication, Communication Networks Barriers to Communication Professional Communication</p>
<p>Unit II: Professional Communication 8 hours</p> <p>Features of professional communication Importance of Business/Technical Communication</p>
<p>Unit III: Word Formation 8 hours</p> <p>Word Formation Basic sentence structure Common Errors: Subject- Verb agreement, prepositions, Articles, Place of adverb, Consistency of tenses.</p>
<p>Unit IV : Paragraph 8 hours</p> <p>Paragraph Writing: Methods, unity and coherence Reading Skills: Types, Strategies, Barriers,</p>
<p>Unit V: Official Communication 9 hours</p> <p>Official Communication: Letter, Memo, Agenda and Minutes of meeting, notice and circular, and email Job Application</p>

COURSE PLAN

Functional English	Topics	Hours
Unit 1 Basics of Grammar	Vocabulary Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words	2
Unit II Basics of Grammar – Part II	Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms	1
Unit III Writing Skills	Letter Writing, Email, Essay, Articles, Memos, one word substitutes, note making and Comprehension	2
Unit IV Writing and Reading	Summary writing, Creative writing, newspaper reading	1
Unit V Practical Exercise	Formal speech, Phonetics, semantics and pronunciation	1
Communication		
Introduction	Communication process. Elements of communication Barriers of communication and how to overcome them. Nuances for communicating with patients and their attenders in hospitals	1

Speaking	Importance of speaking efficiently Voice culture. Preparation of speech. Secrets of good delivery Audience psychology, handling Presentation skills. Individual feedback for each student Conference/Interview technique	2
Listening	Importance of listening Self-assessment Action plan execution. Barriers in listening. Good and persuasive listening	2
Reading	What is efficient and fast reading Awareness of existing reading habits Tested techniques for improving speed Improving concentration and comprehension through systematic study.	1
Non Verbal Communication	Basics of non-verbal communication Rapport building skills using neuro- linguistic programming (NLP)	1
Communication in Optometry practice		1
Total		15

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	GENERAL ANATOMY PRACTICAL-I			
Course Code	BOPT1051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

1. Describe the gross structure of human body
2. Describe , specifically musculo-skeletal, Cardio-respiratory and nervous system.
3. Apply the anatomical principles in the practice of Optometry.

Course Outcomes:

CO1	Students should able to understand the normal disposition,inter relationships, gross functional and applied anatomy of various structures in the human body
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Text Books

1. BD Chaurasia: Handbook of general Anatomy, Third edition, CBS Publishers, New Delhi, 1996
2. GJ Tortora, B Derrickson: Principles of Anatomy and Physiology,11th edition, John Wiley & Sons Inc, 2007

Reference Books

1. H.McMinn, John Pegington, Peter H. Abrahams. A Color Atlas of Human Anatomy 3rd edition, M, Mosby, 1996, ISBN: 978-0815158585
2. Richard S. Snell. Clinical Anatomy for Medical Students 6th edition, Lippincott Williams & Wilkins, 2000, ISBN: 9780781715744
3. Derek Field. Field's Anatomy, Palpation and Surface Marking 4th edition, Butterworth-Heinemann Ltd, 2006, ISBN : 978-0750688482

List of Experiments:

1. Introduction of skeletal system
2. To study of the upper limb bones
3. To study of the lower limb bones
4. To study of the Axial skeleton bones (vertebrae and rib cage)
5. To study of the skull bones
6. To demonstration of microscopic structure of vein and artery

Practical demonstration of each organ using specimen. If specimen for certain organs are not available, then videos can be shown to make the student understand the anatomic structures.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	General Physiology Lab-I			
Course Code	Bopt1052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

At the end of the course the student will be able to: • Explain the normal functioning of various organ systems of the body and their interactions. • Elucidate the physiological aspects of normal growth and development. • Describe the physiological response and adaptations to environmental stresses. • Know the physiological principles underlying pathogenesis of disease.

Course Outcome

CO-I	Explain the normal functioning of various organ systems of the body and their interactions
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TEXT BOOKS:-

1. L Prakasamreddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad, 2008
2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008

REFERENCE BOOKS:-

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
2. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company, Japan, 3. G J Tortora, B Derrickson: Principles of anatomy & physiology, 11th edition, Harper & Row Publishers, New York

List of Experiments:

Demonstrate the ABO blood grouping given blood sample by the slide method
Demonstration of RH typing by slide method
To determine the hemoglobin of the given sample of blood or ones own blood by the sahils method
Experiment to find normal clotting time
Experiment to find normal bleeding time
To study the methods of separating Plasma from Blood cells
To study the methods of separating serum from Blood
To study the methods of blood collection
To demonstrate CPR (Basic Life Support)

Recommendations by MoHFW

- 1 Blood test: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count, Haematocrit demonstration, ESR, Blood group & Rh. type, Bleeding time and clottingtime
- 2 Digestion: Test salivarydigestions
- 3 Excretion: Examination of Urine, Specific gravity, Albumin, Sugar, Microscopic examination for cells andcysts
- 4 Endocrinology and Reproduction: Dry experiments in the form of cases showing different endocrinedisorders.
- 5 Respiratory System: Clinical examination of respiratory system, Spirometry, Breath holding test
- 6 Cardio Vascular System: Clinical examination of circulatory system, Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulserate
- 7 Central Nervous System: Sensory system, Motor system, Cranial system, Superficial and deepreflexes

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Geometrical Optics Lab-I			
Course Code	BOPT1054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective

The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

Course Outcome

CO-I	Remember knowledge of mirrors and lenses, Predict and interpret the basic properties of the images formed on the retina by the optics of the eye.
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TEXT BOOK:

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
2. . Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

REFERENCE BOOKS:

1. Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.

LIST OF EXPERIMENTS:

1. Refraction through a Prism
2. The Concave mirror - u-v method
3. To measure focal length of a lens
4. Image formation by a convex mirror
5. Image formation by a concave mirror
6. Image formation by a convex lens
5. Image formation by a concave lens

MoHFW recommendations

- 1 Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index
- 2 Thin Prism – measurement of deviation; calculation of the prism diopter
- 3 Image formation by spherical mirrors
- 4 Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
- 5 Concave lens – in combination with a convex lens – power determination.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	General Biochemistry Lab			
Course Code	BOPT1055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

At the end of the course, the student should be able to: demonstrate his knowledge and understanding on:

1. Structure, function and interrelationship of biomolecules and consequences of deviation from normal.
2. Integration of the various aspects of metabolism, and their regulatory pathways.
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data.

Course Outcome

CO-I	Students should able to understand strucutre, function, interrelationship of biomolecules,priciples of various aspects of metobolism and their regulatory pathways
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TEXT BOOK: S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

REFERENCE BOOKS:

1. S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D.R. Whikehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

LIST OF EXPERIMENTS:

1. Qualitative analysis of abnoraml constitutes of urine
2. Demonstration of blood gas and electrolytes
3. Demonstration of glucometer
4. Qualitative analysis of unknown cardohydrates
5. Demonstration of osazone reaction
6. Estimation of photometry- standard graphs for estimation of serum- blood glucose and proteins

Recommendations by MoHFW

1. Reactions of monosaccharides, disaccharides and starch: Glucose Fructose
Galactose Maltose, lactose
Sucrose Starch
2. Analysis of Unknown Sugars Estimation:
Photometry Biofluid of choice – blood, plasma, serum
Standard graphs Glucose
Proteins Urea
Creatinine Bilirubin

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Functional English Lab-1			
Course Code	FENG1002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course Outcomes

At the end of the course, students will be able to:

CO1	Develop the understanding into the communication and language as its medium
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Text Books

- 1 Course Title: Better Spoken English by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOkQCOElxcDQrs>
- 2 Course Title: Understanding Creativity and Creative Writing by Prof. Neelima Talwar(NPTEL)
<http://www.digimat.in/nptel/courses/video/109101017/L01.html>

Reference Books

- 3 Course Title: Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)
https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH
- 4 Course Title: English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>

The following activities will be conducted in lab classes:

- Introduction
- Extempore
- Movie Review
- Phonetics (Sounds)
- Phonetics (Transcription)
- Practice on Clear Pronunciation
- Practice on Tense Buster
- Role Play
- Group Discussion
- Group Presentation by Students

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Ocular Anatomy			
Course Code	BOPT2001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective:

The objective of the course is to:

1. . Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa.
2. Identify the microscopic structures of various tissues in the eye and correlate the structure with the functions.
3. Comprehend the basic structure and connections between the various parts of the central nervous system and the eye so as to understand the neural connections and distribution.
4. To understand the basic principles of ocular embryology.

Course Outcomes

At the end of the course, students will be able to:

CO1	Relate the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa.
CO2	Generalise the microscopic structures of various tissues in the eye and correlate the structure with the functions.
CO3	Generalise the basic structure and connections between the various parts of the central nervous system and the eye so as Understand the neural connections and distribution.
CO4	Generalise the basic principles of ocular embryology
CO5	Generalise the basic principles of ocular embryology
CO6	To be able to apply the knowledge about recent advancement in Ocular Anatomy

Text Books

- 1 L A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.

Reference Books

- 1 AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

Course Content

Unit I: Central nervous system hours 1.1 Spinal cord and brain stem 1.2 Cerebellum 1.3 Cerebrum.	8
Unit II: Orbit Orbit 2.1 Eye 2.2 Sclera 2.3 Cornea 2.4 Choroid 2.5 Ciliary body 2.6 Iris 2.7 Retina	8 hours
Unit III: Refractory media- 3.1 Aqueous humor 3.2 Anterior chamber 3.3 Posterior chamber 3.4 Lens 3.5 Vitreous body	8 hours
Unit IV : Eyelids Eyelids	8 hours
Unit V: Conjunctiva Conjunctiva, Embryology	8 hours
Unit VI: Recent Advancement Recent Advancement in Ocular Anatomy Recent Advances in ocular drug delivery systems New Technologies in Eye surgery	8 hours

COURSE PLAN (Total: 45 hours)

1. Central nervous system:
 - 11 Spinal cord and brain stem
 - 12 Cerebellum
 - 13 Cerebrum.
2. Orbit
 - 21 Eye
 - 22 Sclera
 - 23 Cornea
 - 24 Choroid
 - 25 Ciliary body
 - 26 Iris
 - 27 Retina
3. Refractory media-
 - 31 Aqueous humor
 - 32 Anterior chamber
 - 33 Posterior chamber
 - 34 Lens
 - 35 Vitreous body
4. Eyelids
5. Conjunctiva
6. Embryology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Ocular Physiology			
Course Code	BOPT2002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective:

The objective of the course is to:

1. Explain the normal functioning of all structures of the eye and their interactions
2. Elucidate the physiological aspects of normal growth and development of the eye
3. Understand the phenomenon of vision
4. List the physiological principles underlying pathogenesis and treatment of diseases of the eye

Course Outcomes

At the end of the course, students will be able to:

CO1	Explain the normal functioning of all structures of the eye and their interactions
CO2	Illustrate physiological aspects of normal growth and development of the eye
CO3	Explain the phenomenon of vision
CO4	Identify the physiological principles underlying pathogenesis and treatment of diseases of the eye
CO5	Illustrate and apply the knowledge in Identifying the malfunction in the ocular muscles and cranial nerves
CO6	To be able to apply the knowledge about recent advancement in Ocular Physiology

Text Books

- 1 AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

Reference Books

- 1 RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
- 2 PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, 2002

Course Content

Unit I: Layers of Eye	8 hours
Protective mechanisms in the eye: Eye lids and lacrimation, description of the globe	
2. Extrinsic eye muscles, their actions and control of their movements	
3. Coats of the eye ball	
4. Cornea	
5. Aqueous humor and vitreous: Intra ocular pressure.	
Unit II: Iris and pupil	8 hours
6 Iris and pupil	
7. Crystalline lens and accommodation – presbyopia	
8. Retina – structure and functions	
9. Vision – general aspects of sensation	
10. Pigments of the eye and photochemistry	
Unit III: Visual stimulus, refractive errors	8 hours
12. Visual acuity, Vernier acuity and principle of measurement	
13. Visual perception – Binocular vision, stereoscopic vision, optical illusions	
14. Visual pathway, central and cerebral connections	
15. Colour vision and colour defects. Theories and diagnostic tests	
Unit IV Electrophysiology	8 hours
Introduction to electro physiology	
17. Scotopic and Photopic vision	
18. Color vision, Color mixing	
19. Mechanism of accommodation	
20. Retinal sensitivity and Visibility	
Unit V: Visual function	8 hours
Receptive stimulation and flicker	
22. Ocular, movements and saccades	
23. Visual perception and adaptation	
24. Introduction to visual psychology (Psychophysics)	
Unit VI : Recent Advances	8hours
25. Visual evoked potential	
26. Visual cycle	
27. Recent advances in research on Ocular physiology	
28. Interdisciplinary research to evaluate biochemical composition of eye fluid	

COURSE PLAN: (Total: 45 hours)

1. Protective mechanisms in the eye: Eye lids and lacrimation, description of the globe
2. Extrinsic eye muscles, their actions and control of their movements
3. Coats of the eyeball
4. Cornea
5. Aqueous humor and vitreous: Intra ocular pressure
6. Iris and pupil
7. Crystalline lens and accommodation –presbyopia
8. Retina – structure and functions
9. Vision – general aspects of sensation
10. Pigments of the eye and photochemistry
11. The visual stimulus, refractive errors
12. Visual acuity, Vernier acuity and principle of measurement
13. Visual perception – Binocular vision, stereoscopic vision, optical illusions
14. Visual pathway, central and cerebral connections
15. Colour vision and colour defects. Theories and diagnostic tests
16. Introduction to electrophysiology
17. Scotopic and Photopic vision
18. Color vision, Color mixing
19. Mechanism of accommodation
20. Retinal sensitivity and Visibility
21. Receptive stimulation and flicker
22. Ocular, movements and saccades
23. Visual perception and adaptation
24. Introduction to visual psychology (Psychophysics)

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Physical Optics			
Course Code	BOPT2003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective:

The objective of this course is to equip the students with a thorough knowledge of properties of light. At the end of this course, students will be able to predict the distribution of light under various conditions.

Course Outcomes

At the end of the course, students will be able to:

CO1	A thorough demonstrative knowledge of properties of light
CO2	To interpret the distribution of light under various conditions
CO3	Demonstrate and explain the various refractive conditions based on the different phenomenon of light
CO4	Explain and demonstrate the knowledge in correcting the refractive errors
CO5	To demonstrate the prediction of light through different types of lenses and mirrors
CO6	To be able to apply the knowledge about recent advancement in Physical Optics

Text Books

- 1 Subrahmanyam N, BrijLal, A text book of Optics, S. Chand Co Ltd, New Delhi, India, 2003.

Reference Books

- 1 Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
2. Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002.

Course Content

Unit I: Nature of Light	8 hours
Nature of light –light as electromagnetic oscillation –wave equation; ideas of sinusoidal oscillations – simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase.	
2. Sources of light; Electromagnetic Spectrum.	
3. Polarized light; linearly polarized light; and circularly polarized light.	
Unit II: Polarised light	8 hours
6 Intensity of polarized light; Malus' Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle.	
5. Birefringence; ordinary and extraordinary rays.	
6. Relationship between amplitude and intensity.	
7. Coherence; interference; constructive interference, destructive interference; fringes; fringe width.	
Unit III: Interference	
8 hours	
12 Double slits, multiple slits, gratings.	
9. Diffraction; diffraction by a circular aperture; Airy's disc	
10. Resolution of an instrument (telescope, for example); Raleigh's criterion	
Unit IV LASER	8 hours
Scattering; Raleigh's scattering; Tyndall effect.	
12. Fluorescence and Phosphorescence 2	
13. Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's theory of lasers.	
Unit V Radiometry	8 hours
. Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units	
15. Inverse square law of photometry; Lambert's law.	
16. Other units of light measurement; retinal illumination;	
Unit VI- Recent advances	8 hours
17. Ocular interferometry	
18. Use of Telescope by visually disabled	
19. Recent advancement in the optics of new generation devices	

COURSE PLAN

No.	Topics	No of hrs.
1.	Nature of light –light as electromagnetic oscillation –wave equation; ideas of sinusoidal oscillations –simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase.	7
2.	Sources of light; Electromagnetic Spectrum.	3
3.	Polarized light; linearly polarized light; and circularly polarized light.	3
4.	Intensity of polarized light; Malus' Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle.	2
5.	Birefringence; ordinary and extraordinary rays.	2
6.	Relationship between amplitude and intensity.	1
7.	Coherence; interference; constructive interference, destructive interference; fringes; fringe width.	2
8.	Double slits, multiple slits, gratings.	2
9.	Diffraction; diffraction by a circular aperture; Airy's disc	2
10.	Resolution of an instrument (telescope, for example); Raleigh's criterion	2
11.	Scattering; Raleigh's scattering; Tyndall effect.	2
12.	Fluorescence and Phosphorescence	2
13.	Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's theory of lasers.	5
14.	Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units	4
15.	Inverse square law of photometry; Lambert's law.	3
16.	Other units of light measurement; retinal illumination; Trolands	3
	Total number of Lectures	45

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Infection Control Measure			
Course Code	BOPT2004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective:

The objective of the course is to:

- Be able to identify sources of infections.
- Understand the various ways that infections may be transmitted.
- Understand the chain of infection and how it helps us identify effective ways to control risks.
- Be fully aware of what preventative measures and remedial actions help prevent infections from transmitting.

Course Outcomes

At the end of the course, students will be able to:

CO1	Background of infection prevention and control
CO2	The prevention and control of infection
CO3	Preventive practices
CO4	Explain and demonstrate the knowledge in correcting the refractive errors
CO5	Management of infectious diseases

Text Books

1. Text Book of Preventive and Social Medicine by Piyush Gupta
2. Community Medicine with Recent Advances: A. H. Suryakantha

Course Content

Unit I: hours Background of infection prevention and control	8
Unit II: : The prevention and control of infection	8 hours
Unit III: Preventive practices Preventive practices Use of engineering and work practice controls and preventive practices to reduce the opportunity for exposure to potentially contaminated material and infected patients	8 hours
Unit IV Infection prevention and control Creation and maintenance of a safe environment through application of infection prevention and control principles and practices	8 hours
Unit V Management of infectious diseases . Prevention and management of infectious diseases in healthcare workers	8 hours
Unit VI Recent Advancements in Infection Control Measures Latest techniques of Segregation & disposal of infectious waste Global policy of infection control waste disposal Specialised techniques for specific areas	8 hour

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Operation Theatre Management			
Course Code	BOPT2005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective:

The objective of the course is to:

To manage Operation Theatre. Role of each member in team. Infection control. Hospital waste management. Rules and regulations regarding Operation theatre management.

Medical waste is any kind of waste that contains infectious material (or material that's potentially infectious). This definition includes waste generated by healthcare facilities like physician's offices, hospitals, dental practices, laboratories, medical research facilities, and veterinary clinics.

Course Outcomes

At the end of the course, students will be able to:

CO1	Know about Operation Theatre
CO2	Know about Role of Operation theatre staff
CO3	Preventive practices & Infection control methods
CO4	Hospital waste control
CO5	Rules and regulations

Text Books

- 1 Text Book of Preventive and Social Medicine by Piyush Gupta
- 2 Community Medicine with Recent Advances: A. H. Suryakantha
- 3 Fluke C. Handling hazardous waste. J ... hospital. Pak J Med Res 2001;40:13-17. 3. Ather S

Course Content

Unit I: Operation Theatre introduction	8 hours
<ol style="list-style-type: none"> 1. Introduction aim and objective of this course 2. Definition of minor OT, Full fledge Operation Theatre, First Aid centre, PHC, and Emergency, OPD, IPD. 3. Operation theatre and its basic standards 4. Role and need of Operation theatre 5. Operation theatre and its types 6. Operation theatre and various treatments of Eye done there 	

7. Role of Optometrist in Operation theatre

Unit II: Role of Operation theatre staff	8 hours
<ol style="list-style-type: none"> 1. Infection control Measures 2. Communicable diseases. 3. Decontaminating/Disinfections/ Sterilization 4. Techniques of infection control?: autoclaving / shredding /incrimination /bio hazard symbols. Microwave,, plasma torch. 5. Infection control system in hospital Technologies a)Wet thermal technology b) Incineration-different models Alternative Treatment Technologies Microwave Technology Rotaclave system, Hydro clave system Electro Thermal Reactivation(ETP), Treatment Process Electron beam Technology, Plasma Pyrolysis/Gasofication systems 6. Hospital acquired Infection Health & safety Practices 7. Usage of protective equipment Occupational health programmers & safety practices Emergency measures. 8. Management of non-clinical support devices pretreatment of linen, laundry, central sterilization unit(CSSD) 	
Unit III: Hospital waste)	8 hours
Preventive practices Use of engineering and work practice controls and preventive practices to reduce the opportunity for exposure to potentially contaminated material and infected patients	
Unit IV Infection prevention and control	8 hours
<ol style="list-style-type: none"> 1. Hospital waste management 2. What is waste, 3. Sources of waste more specifically Hospital waste 4. Specification of waste. Color coding and risk associated with them. 5. Disposal Technologies Collection & Handling of waste Recycle, Reuse and disposal of waste 6. Legislation, policies and law regarding environment on Health care waste management. Biomedical waste management and handling rules, 1998 and its amendment there after.CPCB guidelines. (Central pollution control board)Some idea on safe disposal of Radioactive waste rules,1995 guideline of BARC 	
Unit V Rules and regulations	8 hours
<ol style="list-style-type: none"> 1. Rules and regulations regarding Operation theatre management 2. Government policies and practices 3. Medical standards NABH 4. Medical Negligence rules and regulations 	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Hospital Waste Management			
Course Code	BOPT2006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective:

The objective of the course is to:

To manage medical waste. Medical waste is any kind of waste that contains infectious material (or material that's potentially infectious).

This definition includes waste generated by healthcare facilities like physician's offices, hospitals, dental practices, laboratories, medical research facilities, and veterinary clinics..

Course Outcomes

At the end of the course, students will be able to:

CO1	Know about Hospital Waste management
CO2	Know about Role of Legislation, policies and law
CO3	Know about Basic steps in Health Care Waste Management Segregation
CO4	Know about Handling of waste & Infection control
CO5	Know about Disposal Technologies:

Text Books

- Text Book of Preventive and Social Medicine by Piyush Gupta
- Community Medicine with Recent Advances: A. H. Suryakantha
- Fluke C. Handling hazardous waste. J ... hospital. Pak J Med Res 2001;40:13-17. 3. Ather S

Course Content

Unit I Introduction of Hospital Waste	8 hours
Introduction, definition of general and hazardous health care waste and diseases.	
Infectious waste, genotoxic waste, waste sharps, biomedical waste categories categorization and composition of Biomedical waste.	
Specification of materials. Color coding.	
Sources of Health care wastes, Hospitals and health care establishments & other sources. Specifically Communicable diseases.	

Unit II: Legislation, policies and law	8 hours
Legislation, policies and law regarding environment on Health care waste management. Biomedical waste management and handling rules, 1998 and its amendment there after.CPCB guidelines. (Central pollution control board)Some idea on safe disposal of Radioactive waste rules,1995 guideline of BARC	
Unit III: Basic steps in Health Care Waste Management Segregation	8 hours
Basic steps in Health Care Waste Management Segregation at the point of generation sharp Decontaminating/Disinfections unit on container for autoclaving Sharp waste containers for storage and transportation autoclaving/ shredding /incrimination /bio hazard symbols. Microwave, Hydropulbing, plasma torch.	
Unit IV Handling of waste & Infection control	8 hours
Collection & Handling of waste. Infection control system in hospital. Needle sticks injury and other sharp injury and hospital policy for protection of health care workers. On site Pre-treatment of waste. Conventional Treatment Technologies a)Wet thermal technology b) Incineration-different models Alternative Treatment Technologies Microwave Technology Rotaclave system, Hydro clave system Electro Thermal Reactivation(ETP), Treatment Process Electron beam Technology, Plasma Pyrolysis/Gasificaton systems.	
Unit V Disposal Technologies	8 hours
(b) Sharp disposal pit (b) Deep-burial pit (c) Secured land fill. Waste Minimization Recycling. Re-use. Health & safety Practices. Usage of protective equipment Occupational health programmers & safety practices Emergency measures. Management of non-clinical support devices pretreatment of linen, laundry, cental sterilization unit(CSSD)	
Unit VI Recent Advancements in Hospital Waste	8 hour
Latest techniques of Segregation & disposal of Hospital waste Global policy of Hospital waste disposal Specialised techniques for specific areas	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Geometrical Optics-II			
Course Code	BOPT2007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives

The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

Course Outcomes

At the end of the course, students will be able to:

CO1	To generalise the basic knowledge of mirrors and lenses
CO2	To relate the basic properties of the images formed on the retina by the optics of the eye.
CO3	To generalise and explain the various refractive conditions based on the different phenomenon of light
CO4	To generalise and explain and apply the knowledge in correcting the refractive errors
CO5	To generalise and explain the prediction of light through different types of lenses and mirrors
CO6	To be able to apply the knowledge about recent advancement in Geometrical Optics-II

TEXT BOOK:

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
2. . Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

REFERENCE BOOKS:

1. Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
2. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

Course Content

Unit I: Eye & its Functions 1 Vergence and vergence techniques revised. Gullstrand's schematic eyes, visual acuity, Stile Crawford	6 hours
Unit II: Refractive Errors 9 Emmetropia and ametropia	7 hours

4. Blur retinal Imaginary 5. Correction of spherical ametropia, vertex distance and effective power, dioptric power of the spectacle, to calculate the dioptric power, angular magnification of spectacles in aphakic.	
Unit III: Astigmatism 17. Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification. 7. Aperture stops- entrance and exit pupils. 8. Astigmatism. - To calculate the position of the line image in a spher	7 hours
Unit IV :Accommodation & Presbyopia . Accommodation –Accommodation formulae and calculations. 10. Presbyopia- Spectacle magnification, angular magnification of spectacle lens, near point, calculation of add, depth of field..	6 hours
Unit V: Post surgical Refractive errors 33. Spatial distribution of optical information- modulation transfer functions- Spatial filtering- applications. 12. Visual optics of aphakia and pseudophakia.	6 hours
Unit VI: Research advancements in Geometrical optics Quantum, Atomic, and Biological Optics Control of Atoms by Light Fundamental Quantum Limits of Measurement Light in Biology	6 hours

COURSE PLAN: Total: 45 hours

1. Vergence and vergence techniques revised.
2. Gullstrand's schematic eyes, visual acuity, Stile Crawford
3. Emmetropia and ametropia
4. Blur retinal Imaginary
5. Correction of spherical ametropia, vertex distance and effective power, dioptric power of the spectacle, to calculate the dioptric power, angular magnification of spectacles in aphakic
6. Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification.
7. Aperture stops- entrance and exit pupils.
8. Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens.
9. Accommodation –Accommodation formulae and calculations.
10. Presbyopia- Spectacle magnification, angular magnification of spectacle lens, near point, calculation of add, depth of field.
11. Spatial distribution of optical information- modulation transfer functions- Spatial filtering- applications.
12. Visual optics of aphakia and pseudophakia.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	OCULAR BIOCHEMISTRY			
Course Code	BOPT2008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives At the end of the course, the student should be able to demonstrate his knowledge and understanding on

1. Structure ,function and interrelationship of biomolecules and consequences of deviation from the normal
2. Integration of various aspects of metabolism and their regulatory pathways
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data
4. Understand metabolic processes taking place in different ocular structures.

Course Outcomes

At the end of the course, students will be able to:

CO1	On completion of this course, the students will be able to understand Structure, function and interrelationship of biomolecules
CO2	On completion of this course, the students will be able to understand consequences of deviation from normal
CO3	On completion of this course, the students will be able to understand. Integration of the various aspects of metabolism, and their regulatory pathways
CO4	On completion of this course, the students will be able to understand Principles of various conventional and specialized laboratory investigations
CO5	On completion of this course, the students will be able to understand analysis and interpretation of a given data.
CO6	To be able to apply the knowledge about recent advancement in Ocular Biochemistry

TEXT BOOK: S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

REFERENCE BOOKS:

- S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras,1990
- D.R. Whitehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania,2003

Course Content

Unit I Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)	8 Hrs
Unit II Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)	8 Hrs
Unit III Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane	8 Hrs
Unit IV Vitamins: General with emphasis on A, B2, C, E and inositol (requirements, assimilation and properties)	8 Hrs
Unit V Minerals: Na, K, Ca, P, Fe, Cu and Se (requirements, availability and properties) Mode of Evaluation: The theory and lab performance of students are evaluated separately	8 Hrs
Unit VI Ocular Biochemistry Various aspects of eye, cornea, lens, Retina	8Hrs

COURSE PLAN: (Total: 15 hours)

1. Hormones basic concepts in metabolic regulation with examples say insulin.
2. Metabolism: General whole body metabolism (carbohydrates, proteins, lipids)
3. Ocular Biochemistry: Various aspects of the eye, viz., cornea, lens aqueous, vitreous, retina and pigment rhodopsin. (The important chemicals in each and their roles.)
Immunology of anterior segment
4. Technique: Colloidal state, sol. Gel. Emulsion, dialysis, electrophoresis. pH buffers mode of action, molar and percentage solutions, photometer, colorimeter and spectrometry. Radio isotopes: application in medicine and basic research.
5. Clinical Biochemistry: Blood sugar, urea, creatinine and bilirubin significance of their estimation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Energy and Environmental Sciences			
Course Code	ENVS1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. To develop awareness about our environment.
2. To develop a concern about sustainable development

Course Outcomes

At the end of the course, students will be able to:

CO1	Understand About environment and its components and Problems associated with natural resources and their sustainable use
CO2	Chemical Toxicity of the chemicals in the environment and Sources of pollution in air , water and soil and Solid waste management and natural Disaster management
CO3	Understanding about social issues
CO4	Understanding of role of information technology to address environmental issues.
CO5	Application of sustained Chemistry

Text Books

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.
2. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5
3. Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005,ISBN: 978 81 7371 540 2
4. Environmental Studies (From Crisis to Cure) Second Edition. , R. Rajagopalan, Oxford University Press, 2012, ISBN 0-19-807208-2.
5. Environmental Studies, Ranu Gadi, Sunitta Rattan, Sushmita Mohapatra, S.K. Kataria and Sons , 2008, ISBN: 81-89757-98-9.

Reference Books

1. Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.
2. Environmental Studies, Anindita Basak, Pearson Education, 2009, ISBN: 978-81-317-2118-6.
3. Principles of Environmental Science (Inquiry and Applications), William P. Cunningham & Mary Ann Cunningham, Tata McGraw Hill Education Private Limited,2007, ISBN: 987-0-07-064772-0.

Course Content

Unit I: Environment & Natural Resources	8 hours
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources – Use and exploitation, environmental effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.	
Unit II: Chemical Toxicology	8 hours
Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides	
Unit III: Environmental Pollution	8 hours
Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.	
Unit IV : Social Issues, Human Population and the Environment	8 hours
Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.	
Unit V: Green Chemistry	9 hours
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.	
Unit V: Recent Advancement	8 hours
RECENT ADVANCES in ENVIRONMENTAL SCIENCE Current Environmental Issues	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Functional English-II			
Course Code	FENG1003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course Outcomes

At the end of the course, students will be able to:

CO1	Develop the understanding into the communication and language as its medium
CO2	Develop the basic understanding of spoken English
CO3	Improve their reading fluency skills through extensive reading
CO4	Use and assess information from academic sources, distinguishing between main ideas and details
CO5	Compare and use a range official support through formal and informal writings

Text Books

- 1 Course Title: Better Spoken English by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOqQCOElxcDQrs>
- 2 Course Title: Understanding Creativity and Creative Writing by Prof. Neelima Talwar(NPTEL)
<http://www.digimat.in/nptel/courses/video/109101017/L01.html>

Reference Books

- 3 Course Title: Communication Skills by Dr. T. Ravichandran,Department of Humanities and Social Sciences (NPTEL)
https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH
- 4 Course Title: English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>

Course Content

Unit I Technical Writing	8 hours
<ul style="list-style-type: none">• Technical Writing: Meaning, Types, Style, Features• Report: Types, Format, Structure, Citation, Planning and writing, Project report•	
Unit II: Planning and Writing	8 hours
<ul style="list-style-type: none">• Manual and user guide: general layout, planning and writing	
Unit III: Proposal	8 hours
<ul style="list-style-type: none">• Proposal: Types, format, structure, planning and writing• Listening vs Hearing, Steps and Types of listening; Barriers of Listening, Methods to improve listening	
Unit IV : Group Discussion	8 hours
Group Discussion,	
Unit V: Presentations	9 hours
<ul style="list-style-type: none">• Spelling and Phonetic Inconsistencies in English• Basics of Pronunciation, Organs of speech, articulation, Introduction to Sounds (IPA)• Phonetic/Phonemic Transcription Presentation Strategies: Purpose, Audience and locale analysis, Non-verbal aspects, voice and pronunciation, effective PowerPoint preparation	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Ocular Anatomy Lab			
Course Code	BOPT2051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

1. . Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa.
2. Identify the microscopic structures of various tissues in the eye and correlate the structure with the functions.
3. Comprehend the basic structure and connections between the various parts of the central nervous system and the eye so as to understand the neural connections and distribution.
4. To understand the basic principles of ocular embryology.

Course Outcomes

At the end of the course, students will be able to:

CO1	Relate the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye.
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Text Books

- 1 L A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.

Reference Books

- 1 AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

List of Experiments

1. Experiment to study to understand the anatomical planes, movements and directions of the Eye Ball
2. Experiment to observe the model eye. To identify and learn the functions of the structures
3. Experiment to observe and learn the layers of Cornea
4. Experiment to observe and learn the layers of retina.
5. Experiment to learn and review the structures of the visual pathway
6. Experiment to study and review the structures of tearfilm.
7. Experiment to understand and review the Lacrimal gland and lacrimal Appartus
8. Experiment to observe and understand the pupillary reflexes
9. Experiment to reveal any asymmetry of afferent input in the pupillary light

MoHFW

1. Eye: Practical dissection of bull's eye
2. Orbit: Practical demonstration of orbital structures.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Ocular Physiology Lab			
Course Code	BOPT2052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

1. Explain the normal functioning of all structures of the eye and their interactions
2. Elucidate the physiological aspects of normal growth and development of the eye
3. Understand the phenomenon of vision
4. List the physiological principles underlying pathogenesis and treatment of diseases of the eye

Course Outcomes

At the end of the course, students will be able to:

CO1	Explain the normal functioning of all structures of the eye and their interactions
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Text Books

- 1 AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

Reference Books

- 1 RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
- 2 PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, List of Experiments

To understand the types of Extra Ocular Muscles with their functions

To understand the Assessment of movements and alignment of eyes by using Broad H test.

To understand and perform the quantitative measurement of tears using schirmers test I

To understand and perform the quantitative measurement of tears using schirmers test II

To understand and perform the RAPD

MoHFW recommendations

1. Lid movements
2. Tests for lacrimation tests
3. Extra ocular movements
4. Break up time
5. Pupillary reflexes
6. Applanation tonometry
7. Schiottz tonometry.
8. Measurement of accommodation and convergence
9. Visual acuity measurement.
10. Direct ophthalmoscopy
11. Indirect ophthalmoscopy
12. Retinoscopy
13. Light and dark adaptation.
14. Binocular vision(Stereopsis)

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Physical Optics			
Course Code	BOPT2053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

1. to equip the students with a thorough knowledge of properties of light. At the end of this course, students will be able to predict the distribution of light under various conditions

Course Outcomes

At the end of the course, students will be able to:

CO1	A thorough demonstrative knowledge of properties of light
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Text Books

- 1 Subrahmanyam N, BrijLal, A text book of Optics, S. Chand Co Ltd, New Delhi, India, 2003.

Reference Books

- 1 Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
2. Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts,

List of Experiments

1. Determination of wavelength of light and scattering of light
2. diffraction of light through small circular aperture
3. Verification of malu's law using polarizer and analyzer combination
4. Demonstration of Interference
5. Measurement of resolving power
6. Various testings for resolving power
7. Calculaation of Magnification of Telescope
8. Calculaation of Magnification of Telescope
9. Study of recent advances in Ocular devices and optics

MoHFW recommendations

PRACTICAL: Total : 15 hours

Each practical session could be evaluated for 10 marks and the total could be added to the final evaluations. These practical could be customized as per the university requirements and spaced apart conveniently. The practical to be done include the following:

1. Gratings – determination of grating constant using Sodium vapour lamp; determination of wavelengths of light from Mercury vapour lamp
2. Circular Apertures – measurements of Airy’s disc for apertures of various sizes
3. Verification of Malus’ Law using a polarizer – analyzer combination
4. Demonstration of birefringence using Calcite crystals
5. Measurement of the resolving power of telescopes.
6. Newton’s rings
7. Demonstration of fluorescence and phosphorescence using crystals and paint

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Geometrical Optics Lab-II			
Course Code	BOPT2054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

Course Outcomes

At the end of the course, students will be able to:

CO1	To generalise the basic knowledge of mirrors and lenses
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TEXT BOOK:

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
2. . Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

REFERENCE BOOKS:

1. Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
2. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

List of Experiments

- 1 The study and understand the construction of a simple refracting telescope and calculate the magnification
- 2 The study and understand the construction of a simple low power microscope from two converging lenses
- 3 The study will observe interference fringes formed by a layer of air between two pieces of glass.
- 4 The student will observe polarized light and how it is affected when it passes through stressed transparent plastic materials
- 5 Diffraction of light very small aperture

MoHFW recommendations

PRACTICAL: Total: 15 hours

1. Construction of a tabletop telescope – all three types of telescopes.
2. Construction of a tabletop microscope
3. Imaging by a cylindrical lens – relationship between cylinder axis and image orientation
4. Imaging by two cylinders in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinders' powers and orientations
5. Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	OCULAR BIOCHEMISTRY			
Course Code	BOPT2055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives At the end of the course, the student should be able to demonstrate his knowledge and understanding on

5. Structure ,function and interrelationship of biomolecules and consequences of deviation from the normal
6. Integration of various aspects of metabolism and their regulatory pathways
7. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data
8. Understand metabolic processes taking place in different ocular structures.

Course Outcomes

At the end of the course, students will be able to:

CO1	On completion of this course, the students will be able to understand Structure, function and interrelationship of biomolecules
CO2	On completion of this course, the students will be able to understand consequences of deviation from normal
CO3	On completion of this course, the students will be able to understand. Integration of the various aspects of metabolism, and their regulatory pathways
CO4	On completion of this course, the students will be able to understand Principles of various conventional and specialized laboratory investigations
CO5	On completion of this course, the students will be able to understand analysis and interpretation of a given data.

TEXT BOOK: S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

REFERENCE BOOKS:

- S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
- D.R.Whitehart:Biochemistry of the Eye, 2ndedition, Butterworth Heinemann, Pennsylvania, 2000

Course Content

Unit I	8 Hrs
Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)	

Unit II Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)	8 Hrs
Unit III Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane	8 Hrs
Unit IV Vitamins: General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties)	8 Hrs
Unit V Minerals: Na, K, Ca, P, Fe, Cu and Se(requirements, availability and properties) Mode of Evaluation: The theory and lab performance of students are evaluated separately	8 Hrs

COURSE PLAN: (Total: 15 hours)

6. Hormones basic concepts in metabolic regulation with examples say insulin.
7. Metabolism: General whole body metabolism(carbohydrates, proteins, lipids)
8. Ocular Biochemistry: Various aspects of the eye, viz., cornea, lens aqueous, vitreous, retina and pigment rhodopsin. (The important chemicals in each and their roles.)
Immunology of anterior segment
9. Technique: Colloidal state, sol. Gel. Emulsion, dialysis, electrophoresis. pH buffers mode of action, molar and percentage solutions, photometer, colorimeter and spectrometry. Radio isotopes: application in medicine and basic research.
10. Clinical Biochemistry: Blood sugar, urea, creatinine and bilirubin significance of their estimation.

PRACTICAL (Total: 15 hours)

1. Quantitative analysis
2. Abnormal constituents in urine, sugar proteins, ketones, blood and bile salts.
3. Techniques of detection of abnormal constituents of urine:
4. Electrophoresis
 - 4.1 Chromatography
 - 4.2 Preparation of normal, molar and percentage solutions.
 - 4.3 Preparation of buffers, pH determination
5. Demonstration
 - 5.1 Estimation of blood cholesterol
 - 5.2 Estimation of alkaline phosphatase.
 - 5.3 Salivary amylase (effect of ph, etc)
 - 5.4 Milk analysis.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	CLINICAL OPTOMETRY I (STUDENTSHIP)			
Course Code	BOPT2056			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

This course covers various clinical optometry procedures involving external examination, anterior segment and posterior segment examination, neuroophthalmic examination, paediatric optometry examination, and Glaucoma evaluation.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should be able to understand the purpose of setup and requirements
CO2	students should be able to understand the devices and the method of handling
CO3	students should be able to understand the indications and contraindications of the test
CO4	studetns should able to coorelate the step by step procedure and way of documentation of the findings
CO5	students should able to coorealte the interpretation of the findings od the various clinical optometry procedures

Text Books

- 1 Clinical Ophthalmology a systamatic approach by Jack J kanski 8th edition
- 2 A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Reference Books

- 3 Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- 4 D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- 5 J .B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991

Course Content

Unit I Introduction	8 hours
History taking	
Visual acuity estimation	

Extraocular motility, Cover test, Alternating cover test Hirschberg test, Modified Krimsky Pupils Examination	
Unit II: Various test Maddox Rod Van Herrick External examination of the eye, Lid Eversion Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),	8 hours
Unit III: Binocular function test Color Vision Stereopsis Confrontation test Photostress test	8 hours
Unit IV : Eye examinations Slit lamp biomicroscopy Ophthalmoscopy Tonometry ROPLAS	8 hours
Unit V: Miscellaneous test Amsler test Contrast sensitivity function test Saccades and pursuit test	8 hours

MoHFW recommended: Total: 15 hours

Students will observe the basic operations of the optometry clinic while interacting with the multidisciplinary team members involved in providing optimal care to patients. The student will be introduced to optical terminology, equipment, and techniques used for treatment.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course	Environmental Sciences			
Course Code				
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

To develop awareness about our environment.

To develop a concern about sustainable development

Course Outcomes

At the end of the course, students will be able to:

CO1	Understand About environment and its components and Problems associated with natural resources and their sustainable use
CO2	Chemical Toxicity of the chemicals in the environment and Sources of pollution in air , water and soil and Solid waste management and natural Disaster management
CO3	Understanding about social issues
CO4	Understanding of role of information technology to address environmental issues.
CO5	Application of sustained Chemistry

Text Books

- Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.
- Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5
- Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005,ISBN: 978 81 7371 540 2
- Environmental Studies (From Crisis to Cure) Second Edition. , R. Rajagopalan, Oxford University Press, 2012, ISBN 0-19-807208-2.
- Environmental Studies, Ranu Gadi, Sunitta Rattan, Sushmita Mohapatra, S.K. Kataria and Sons , 2008, ISBN: 81-89757-98-9.

Reference Books

- Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.
- Environmental Studies, Anindita Basak, Pearson Education, 2009, ISBN: 978-81-317-2118-6.
- Principles of Environmental Science (Inquiry and Applications), William P. Cunningham & Mary Ann Cunningham, Tata McGraw Hill Education Private Limited,2007, ISBN: 987-0-07-064772-0

Course Content

Unit I: Environment & Natural Resources	8 hours
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation,	

construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources – Use and exploitation, environmental effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.

Unit II: Chemical Toxicology

8 hours

Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides

Unit III: Environmental Pollution

8 hours

Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit IV : Social Issues, Human Population and the Environment

8 hours

Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.

Unit V: Green Chemistry

9 hours

Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.

Unit V: Recent Advancement

8 hours

RECENT ADVANCES in ENVIRONMENTAL SCIENCE
Current Environmental Issues

1	Visit to zoo for studying animal habitat	
2	Visit to garden for studying plant habitat	
3	Visit to aquarium for studying aquatic habitat	
4	Visit to Bird sanctuary to study about various birds	
5	Visit to agricultural farm to study about crop production	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Functional English Lab-II			
Course Code	FENG1004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

Course Outcomes

At the end of the course, students will be able to:

CO1	Develop the understanding into the communication and language as its medium
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Text Books

- 1 Course Title: Better Spoken English by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOkQCOElxcDQrs>
- 2 Course Title: Understanding Creativity and Creative Writing by Prof. Neelima Talwar(NPTEL)
<http://www.digimat.in/nptel/courses/video/109101017/L01.html>

Reference Books

- 3 Course Title: Communication Skills by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)
https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH
- 4 Course Title: English Language for Competitive Examinations By Prof. Aysha Iqbal (NPTEL)
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>

The following activities will be conducted in lab classes:

- Spin-a-yarn
- Drafting Catchphrases
- Picture Interpretation (Denotation and Connotation)
- Active Listening
- Reading between the lines
- Brief Biography of Female Personalities
- Rhythm and Intonation
- Public Speaking
- Mock Lecture
- Dialogue Writing
- Enacting scene(s) from critically appreciated movies

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	OCULAR MICROBIOLOGY			
Course Code	BOPT3001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives:The objectives of the course are:

1. To prepare the students to gain essential knowledge about the characteristics of bacteria, viruses, fungi and parasites;
2. To acquire knowledge of the principles of sterilisation and disinfection in hospital and ophthalmic practice;
3. To understand the pathogenesis of the diseases caused by the organisms in the human body with particular reference to the eye infections and
4. To understand basic principles of diagnostic ocular Microbiology.

Course Outcomes

CO1	To prepare the students to gain essential knowledge about the characteristics of bacteria, viruses, fungi and parasites;
CO2	To acquire knowledge of the principles of sterilisation and disinfection in hospital and ophthalmic practice;
CO3	To understand the pathogenesis of the diseases caused by the organisms in the human body with particular reference to the eye infections
CO4	To understand basic principles of diagnostic ocular Microbiology.
CO5	To correlate the understanding of ocular health and systemic health

Text Book

1. **BURTON G.R.W: Microbiology for the Health Sciences, third edition, J.P. Lippincott Co., St. Louis, 1988.**
2. **M J Pelczar (Jr), ECS Chan, NR Krieg : Microbiology ,fifth edition, TATA McGRAW-HILL Publisher, New Delhi,1993**

Reference Book (s)

1. KJ Ryan, CG Ray: Sherris Medical Microbiology- An Introduction to infectious Diseases, fourth edition, McGRAW HILL Publisher, New Delhi, 1994 MACKIE & McCartney Practical Medical Microbiology
2. SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology (DM)5

PREREQUISITES: Higher secondary Biology

Course Content

Unit-1 Introduction 8 hours Introduction to microbiology 2. Morphology & classification of microorganisms 3. Sterilisation & Disinfections used in the Hospital
Unit-2 Common bacterial infections of the eye. 8 hour Common bacterial infections of the eye.
Unit-3 Common fungal infections of the eye. 8 hour Common fungal infections of the eye
Unit-4 Common viral infections of the eye. 8 hour Common viral infections of the eye.
Unit-5 Common parasitic infections of the eye. .8 hour Common parasitic infections of the eye.
Unit-Immunity Immunity and its types. Cell mediated and humoral immunity- mechanism. Antigen and antibody. Theories of Ab formation. Specific and Non-specific immunity.)

COURSE PLAN: (Total: 15 hours)

1. Morphology and principles of cultivating bacteria
2. Sterilization and disinfections used in laboratory and hospital practice
3. Common bacterial infections of the eye.
4. Common fungal infections of the eye
5. Common viral infections of the eye.
6. Common parasitic infections of the eye.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	VISUAL OPTICS-I			
Course Code	BOPT3002			
Prerequisite	Physical Optics, Geometrical Optics			
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: Upon completion of the course, the student should be able:

1. To understand the fundamentals of optical components of the eye
2. To gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

Course Outcomes

CO1	Students should be able to understand the fundamentals of optical components of the eye
CO2	student should able to gain the theoretical knowledge on the measurement of visual acuity
CO3	student should be able to correlate the skill on visual acuity measurement
CO4	student should able to understand the objective clinical refraction
CO5	students should able to understand the subjective clinical refraction

Text Book

1. A H Tunnacliffe: **Visual optics, The Association of British Optician, 1987.**
2. AG Bennett & RB Rabbets: **Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998**

Reference Book (s)

1. M P Keating: **Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002**
2. HL Rubin: **Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.**
3. H Obstfeld: **Optic in Vision- Foundations of visual optics & associated computations, 2nd edition, Butterworth, UK, 1982.**
4. WJ Benjamin: **Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006**
5. T Grosvenor: **Primary Care Optometry, 4th edition, Butterworth–heinneman, USA, 2002**

Course Content

Unit-1 Introduction 8 hours 1. Review of Geometrical Optics: Vergence and power 1.1 Conjugacy, object space and image space 1.2 Sign convention 1.3 Spherical refracting surface 1.4 Spherical mirror; catoptric power 1.5 Cardinal points 1.6 Magnification 1.7 Light and visual function 1.8 Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Birefringence, Dichroism 1.9 Aberration and application Spherical and Chromatic	
Unit-2 Optics of Ocular Structure 2.1 Cornea and aqueous 2.2 Crystalline lens 2.3 Vitreous 2.4 Schematic and reduced eye	8 hour
Unit-3 Measurements of Optical Constants of the Eye hour 3.1 Corneal curvature and thickness 3.2 Keratometry 3.3 Curvature of the lens and ophthalmophacometry 3.4 Axial and axis of the eye 3.5 Basic Aspects of Vision. 3.5.1 Visual Acuity 3.5.2 Light and Dark Adaptation 3.5.3 Color Vision 3.5.4 Spatial and Temporal Resolution 3.5.5 Science of Measuring visual performance and application to Clin	8
Unit-4 Refractive anomalies and their causes 4.1 Etiology of refractive anomalies 4.2 Contributing variability and their ranges	8 hour
Unit-5 Populating distributions of anomalies. 5.1 Optical component measurements 5.2 Growth of the eye in relation to refractive errors	8 hour
Unit-6 Recent advances in the field of visual optics 6.1- Recent articles on Visual optics 6.2- Subjective refraction methods-Review 6.3 Comparison of different tests (studies)	8 hours

COURSE PLAN (Total: 15 hours)

1. Review of Geometrical Optics: Vergence and power
 - 1.1 Conjugacy, object space and image space
 - 1.2 Sign convention
 - 1.3 Spherical refracting surface
 - 1.4 Spherical mirror; catoptric power
 - 1.5 Cardinal points
 - 1.6 Magnification
 - 1.7 Light and visual function
 - 1.8 Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism
 - 1.9 Aberration and application Spherical and Chromatic
2. Optics of Ocular Structure
 - 2.1 Cornea and aqueous
 - 2.2 Crystalline lens
 - 2.3 Vitreous
 - 2.4 Schematic and reduced eye
3. Measurements of Optical Constants of the Eye
 - 3.1 Corneal curvature and thickness
 - 3.2 Keratometry
 - 3.3 Curvature of the lens and ophthalmophacokometry
 - 3.4 Axial and axis of the eye
 - 3.5 Basic Aspects of Vision.
 - 3.5.1 Visual Acuity
 - 3.5.2 Light and Dark Adaptation
 - 3.5.3 Color Vision
 - 3.5.4 Spatial and Temporal Resolution
 - 3.5.5 Science of Measuring visual performance and application to Clinical Optometry
4. Refractive anomalies and their causes
 - 4.1 Etiology of refractive anomalies
 - 4.2 Contributing variability and their ranges
 - 4.3 Populating distributions of anomalies.
 - 4.4 Optical component measurements
 - 4.5 Growth of the eye in relation to refractive errors

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	OPTOMETRIC OPTICS - I			
Course Code	BOPT3003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: Skills/knowledge to be acquired at the end of this course: -

1. Measurement of lens power , lens centration using conventional techniques
2. Transposition of various types of lenses • Knowledge to identify different forms of lenses (equi-convex, planoconvex, periscopic, etc.)
3. Knowledge to select the tool power for grinding process.
4. Measurement of surface powers using lens measure.
5. Method of laying off the lens for glazing process.
6. Ophthalmic prism knowledge – effects, units, base-apex notation, compounding and resolving prisms.
7. Knowledge of prism and decentration in ophthalmic lenses
8. Knowledge of different types of materials used to make lenses and its characteristics
9. Knowledge lens designs – single vision, bifocals, progressive lenses
10. Knowledge on tinted and protective lenses
11. Knowledge on special lenses like isekonic, spectacle magnifiers.
12. Knowledge on spectacle frames – manufacture, materials

Course Outcomes

CO1	Student should acquire skill and knowledge on measurement of lens power, lens centration using conventional techniques
CO2	Student should be able to perform the transpositions, knowledge to verify different forms of lenses
CO3	student should acquire knowledge on selecting the tools for power grinding process
CO4	student should acquire knowledge on decentration and effects, units, base- apex notation, compounding and resolving prisms
CO5	student should acquire knowledge on lens designs- single vision, bifocals, progressive lenses

Text Book

1. **Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1994.**

Reference Book (s)

1. David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
2. C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996
3. Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996.

Course Content

Unit-1 Introduction 8 hours 1 Light, Mirror, Reflection, Refraction and Absorption Prisms –Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel’s prisms, rotary prisms
Unit-2 Optics of Lenses 8 hour 2 Lenses –Definition, units, terminology used to describe, form of lenses 4. Vertex distance and vertex power, Effectivity calculations
Unit-3 Measurements of Optical Constants of the Lenses 8 hour 3 Lens shape, size and types i.e. Spherical, cylindrical and Sphero-cylindrical 6. Transpositions –Simple, Toric and Spherical equivalent
Unit-4 Optical devices 8 hour Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Planocylinder and Spherocylinder lenses 8. Spherometer & Sag formula, Edge thickness calculations 9. Magnification in high plus lenses, Minification in high minus lenses
Unit-5 Lens anomalies.. 8 hour Tilt induced power in spectacles Aberration in Ophthalmic Lenses
Unit-6 effect of optical aberration on image quality and visual performance compensating effects of aberration high index lenses

COURSE PLAN (Total: 45 hours)

1. Introduction –Light, Mirror, Reflection, Refraction andAbsorption
2. Prisms –Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel’s prisms, rotaryprisms
3. Lenses –Definition, units, terminology used to describe, form oflenses
4. Vertex distance and vertex power, Effectivitycalculations
5. Lens shape, size and types i.e. Spherical, cylindrical andSphero-cylindrical
6. Transpositions –Simple, Toric and Sphericalequivalent
7. Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano- cylinder andSphero-cylinderlenses
8. Spherometer & Sag formula, Edge thicknesscalculations
9. Magnification in high plus lenses, Minification in high minuslenses
10. Tilt induced power inspectacles
11. Aberration in OphthalmicLenses

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	OPTOMETRIC INSTRUMENTS			
Course Code	BOPT3004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective: Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the following instruments

1. Visual Acuity chart/drum
2. Retinoscope
3. Trail Box
4. Jackson Cross cylinder
5. Direct ophthalmoscope
6. Slit lamp Biomicroscope
7. Slit lamp Ophthalmoscopy (+90, 78 D)
8. Gonioscope
9. Tonometer: Applanation Tonometer
10. Keratometer
11. Perimeter
12. Electrodiagnostic instrument (ERG, VEP, EOG)
13. A –Scan Ultrasound
14. Lensometer

Course Outcomes

At the end of the course, students will be able to:

CO1	To understand and generalise the scope and importance of different ophthalmic instruments and appliances
CO2	To explain and demonstrate the functioning and applications in different diseases
CO3	To be able to practice with ophthalmic instruments
CO4	To get operationalize with the detailed knowledge which helps to examine the corneal diseases
CO5	To get operationalize with the detailed knowledge which helps in examine the retinal diseases

Text Books

- 1 David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991

Reference Books

- 1 P R Yoder: Mounting Optics in Optical Instruments, SPIE Society of Photo- Optical Instrumentation, 2002
- 2 G Smith, D A. Atchison: The Eye and Visual Optical Instruments, Cambridge University Press, 1997

Course Content

Unit I: Refractive instruments	8 hours
Optotypes, Test charts standards. Choice of test charts Trial case lenses Refractor (phoropter) head units Optical considerations of refractor units Trial frame design Near vision difficulties with units and trial frames Retinoscope – types available Adjustment of Retinoscopes- special features Projection charts Illumination of the consulting room. Brightness acuity test Pupilometer Potential Acuity Meter Abberometer	
Unit II: Retinoscope	8 hours
Design of retinoscope,Ophthalmoscopes and related devices Design of ophthalmoscopes – illumination Design of ophthalmoscopes- viewing Ophthalmoscope disc Filters for ophthalmoscopy Indirect ophthalmoscope	
Unit III: Instruments	8 hours
Lensometer, Lens gauges or clock Slit lamp Tonometers Keratometer and corneal topography Refractometer,fundus camera	
Unit IV : Orthoptic Instruments	8 hours
Orthoptic Instruments (Synaptophore Only) Color Vision Testing Devices Fields of Vision And Screening Devices Scans ERG,External eye photography	
Unit V: Perimetry	8 hours
Perimeter, Exophthalmometer, specular microscopy	
UNIT:VI Recent advancements in Optometric instruments	
Ocular Coherence Tomography Gonioscopy A scan B scan	

COURSE PLAN (Total: 30 hours)

1. Refractive instruments
 - 1.1 Optotypes and MTF, Spatial Frequency
 - 1.2 Test charts standards.
 - 1.3 Choice of test charts
 - 1.4 Trial case lenses
 - 1.5 Refractor (phoropter) head units
 - 1.6 Optical considerations of refractor units
 - 1.7 Trial frame design
 - 1.8 Near vision difficulties with units and trial frames
 - 1.9 Retinoscope – types available
 - 1.10 Adjustment of Retinoscopes- special features
 - 1.11 Objective optometers.
 - 1.12 Infrared optometer devices.
 - 1.13 Projection charts
 - 1.14 Illumination of the consulting room.
 - 1.15 Brightness acuity test
 - 1.16 Vision analyzer
 - 1.17 Pupilometer
 - 1.18 Potential Acuity Meter
 - 1.19 Abberometer
2. Ophthalmoscopes and related devices
 - 2.1 Design of ophthalmoscopes – illumination
 - 2.2 Design of ophthalmoscopes- viewing
 - 2.3 Ophthalmoscope disc
 - 2.4 Filters for ophthalmoscopy
 - 2.5 Indirect ophthalmoscope
3. Lensometer, Lens gauges or clock
4. Slit lamp
5. Tonometers
6. Keratometer and corneal topography
7. Refractometer
8. Orthoptic Instruments (Synaptophore Only)
9. Color Vision Testing Devices
10. Fields of Vision And Screening Devices
11. Scans
12. ERG
13. New Instruments

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	OCULAR DISEASES - I			
Course Code	BOPT3005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective: At the end of the course the students will be knowledgeable in the following aspects of ocular diseases:

1. Etiology
2. Epidemiology
3. Symptoms
4. Signs
5. Course sequelae of ocular disease
6. Diagnostic approach and
7. Management of the ocular diseases.

Course Outcomes

At the end of the course, students will be able to:

CO1	students should understand the etiology and etiology of refractive errors and the correlation with ocular diseases
CO2	students should able to differentiate between signs and symptom inorder to reach to the diagnosis
CO3	students shoould able to understand the course sequence of ocular diseases
CO4	students should understand the diagnostic approach to make the final diagnosis
CO5	students should able to understand the management of ocular diseases

Text Books

- 1 Clinical Ophthalmology a systamatic approach by Jack J kanski 8th edition
- 2 A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Reference Books

- 1 **Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990**
- 2 **Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007**

Course Content

Unit I: Orbit	8 hours
1.1 Orbit Anatomy & Physiology 1.2 Proptosis (Classification, Causes, Investigations) 1.3 Enophthalmos 1.4 Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome) 1.5 Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis) 1.6 Grave's Ophthalmopathy 1.7 Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma) 1.8 Orbital blowout fractures 1.9 Orbital surgery (Orbitotomy) 1.10 Orbital tumors 1.11 Orbital trauma 1.12 Orbital complications & their Management	
Unit II: Lid	8 hours
1 Lid Anatomy & Physiology 2.2 Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos) 2.3 Oedema of the eyelids(Inflammatory, Solid, Passive edema) 2.4 Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion ,Internalhordeolum, Molluscum Contagiosum) 2.5 Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis). 2.6 Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)	
Unit III: Lacrimal System & Conjunctiva	8 hours
Lacrimal System Anatomy & Physiology 3.2 Tear Film 3.3 The Dry Eye (Sjogren's Syndrome) 3.4 The watering eye (Etiology, clinical evaluation) 3.5 Dacryocystitis 3.6 Swelling of the Lacrimal gland(Dacryoadenitis) 4 Conjunctiva 4.1Conjunctiva Anatomy & Physiology 4.2 Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis) 4.3 Degenerative conditions(Pinguecula, Pterygium, Concretions) 4.4 Symptomatic conditions(Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration) 4.5 Cysts and Tumors	
Unit IV : Cornea	8 hours

Cornea Anatomy and Physiology

5.2 Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea)

5.3 Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative

5.4 Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic))

5.5 Degenerations (classifications, Arcussenilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration)

5.6 Dystrophies (Reis Buckler dystrophy, Recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch's epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy)

5.7 Keratoconus, Keratoglobus

5.8 Corneal oedema, Corneal opacity, Corneal vascularisation

5.9 Penetrating Keratoplasty

Unit V: Uveal Tract and Sclera

8

hours

Anatomy and Physiology of Uvea

6.2 Uveitis

6.3 Etiology

6.4 Pathology

6.5 Anterior Uveitis

6.6 Posterior Uveitis

6.7 Purulent Uveitis

6.8 Endophthalmitis

6.9 Panophthalmitis

6.10 Pars Planitis

6.11 Tumors of uveal tract(Melanoma)

6.12 Episcleritis and scleritis

6.13 Clinical examination of Uveitis and Scleritis

UnitVI: Recent Advancements in Ocular Disease

8 hours Recent advancements in Ocular Diseases

Recent advancements in diagnosis of Ocular Diseases

Recent advancements in management of Ocular Disease

Literature review

U tube videos

Presentations

COURSE PLAN (Total: 45 hours)

1. Orbit
 - 1.1 Applied Anatomy
 - 1.2 Proptosis (Classification, Causes, Investigations)
 - 1.3 Enophthalmos
 - 1.4 Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)
 - 1.5 Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)
 - 1.6 Grave's Ophthalmopathy
 - 1.7 Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma)
 - 1.8 Orbital blowout fractures
 - 1.9 Orbital surgery (Orbitotomy)
 - 1.10 Orbital tumors
 - 1.11 Orbital trauma
 - 1.12 Approach to a patient with proptosis
2. Lids
 - 2.1 Applied Anatomy
 - 2.2 Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos)
 - 2.3 Oedema of the eyelids(Inflammatory, Solid, Passive edema)
 - 2.4 Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion ,Internalhordeolum, Molluscum Contagiosum)
 - 2.5 Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis).
 - 2.6 Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)
3. Lacrimal System
 - 3.1 Applied Anatomy
 - 3.2 Tear Film
 - 3.3 The Dry Eye (Sjogren's Syndrome)
 - 3.4 The watering eye (Etiology, clinical evaluation)
 - 3.5 Dacryocystitis
 - 3.6 Swelling of the Lacrimal gland(Dacryoadenitis)
4. Conjunctiva
 - 4.1 Applied Anatomy
 - 4.2 Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis)
 - 4.3 Degenerative conditions(Pinguecula, Pterygium, Concretions)
 - 4.4 Symptomatic conditions(Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration)
 - 4.5 Cysts and Tumors
5. Cornea
 - 5.1 Applied Anatomy and Physiology
 - 5.2 Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy

- cornea)
- 5.3 Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative
- 5.4 Etiological classifications: Infective, Allergic, Tropic, Traumatic, Idiopathic))
- 5.5 Degenerations (classifications, Arcussenilis, Vogt’s white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann’s nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration)
- 5.6 Dystrophies (Reis Buckler dystrophy, Recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch’s epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy)
- 5.7 Keratoconus, Keratoglobus
- 5.8 Corneal oedema, Corneal opacity, Corneal vascularisation
- 5.9 Penetrating Keratoplasty

- 6. Uveal Tract and Sclera
 - 6.1 Applied Anatomy,
 - 6.2 Classification of uveitis
 - 6.3 Etiology
 - 6.4 Pathology
 - 6.5 Anterior Uveitis
 - 6.6 Posterior Uveitis
 - 6.7 Purulent Uveitis
 - 6.8 Endophthalmitis
 - 6.9 Panophthalmitis
 - 6.10 Pars Planitis
 - 6.11 Tumors of uveal tract(Melanoma)
 - 6.12 Episcleritis and scleritis
 - 6.13 Clinical examination of Uveitis and Scleritis

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	CLINICAL EXAMINATION OF VISUAL SYSTEM			
Course Code	BOPT3006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective: At the end of the course the students will be skilled in knowing the purpose, set- up and devices required for the test, indications and contraindications of the test, step-by-step procedures, documentation of the findings, and interpretation of the findings of the various clinical optometry procedures.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should be able to understand the purpose of setup and requirements
CO2	students should be able to understand the devices and the method of handling
CO3	students should be able to understand the indications and contraindications of the test
CO4	studetns should able to coorelate the step by step procedure and way of documentation of the findings
CO5	students should able to coorealte the interpretation of the findings od the various clinical optometry procedures

TEXT BOOK: T Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinneman, USA, 2007.

REFERENCE BOOKS:

1. A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international(p) Ltd. Publishers, New Delhi, 2007
2. D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
3. Jack J. Kanski Clinical Ophthalmology: A Systematic Approach,6th edition, Butterworth-Heinemann, 2007
4. J.B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991
5. N B. Carlson , Dl Kurtz: Clinical Procedures for Ocular Examination ,3rd edition, McGraw-Hill Medical, 2003

Course Content

Unit I Introduction	8 hours
History taking Visual acuity estimation Extraocular motility, Cover test, Alternating cover test Hirschberg test, Modified Krimsky Pupils Examination	
Unit II: Various test	8 hours
Maddox Rod Van Herrick External examination of the eye, Lid Eversion Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),	
Unit III: Binocular function test	
8 hours Color Vision Stereopsis Confrontation test Photostress test	
Unit IV : Eye examinations	8
hours Slit lamp biomicroscopy Ophthalmoscopy Tonometry ROPLAS	
Unit V: Miscellaneous test	8 hours
Amsler test Contrast sensitivity function test Saccades and pursuit test	
Unit VI	
8 hours Advancements in Clinical examination of visual system Comprehensive Eye Examinations Vision screening VEP & ERG IOL calculations techniques and instruments	

COURSE PLAN (Total: 30 hours)

1. History taking
2. Visual acuity estimation
3. Extraocular motility, Cover test, Alternating cover test
4. Hirschberg test, Modified Krimsky
5. Pupils Examination
6. Maddox Rod
7. Van Herrick
8. External examination of the eye, Lid Eversion
9. Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),
10. Color Vision
11. Stereopsis
12. Confrontation test
13. Photostress test
14. Slit lamp biomicroscopy
15. Ophthalmoscopy
16. Tonometry
17. ROPLAS
18. Amsler test
19. Contrast sensitivity function test
20. Saccades and pursuit test

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	INDIAN MEDICINE AND TELEMEDICINE			
Course Code	BOPT3007			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective: At the end of the course student will be aware of the traditional and the latest healthcare system. The student also will get basic knowledge about the telemedicine practices in India especially in eye care.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should be able to aware of traditional health care systems
CO2	students should be able to aware of latest healthcare systems
CO3	students should get the basic knowledge about the telemedicine practices in india
CO4	students should able to understand the traditional treatment methods
CO5	students should able to coorelate the treatment of ocular diseases using telemedicine with ocular refractive anamolies

Text Books

- 1 Margie Lovett Scott, Faith Prather. Global health systems comparing strategies for delivering health services. Joney & Bartlett learning, 2014 (page 167 -178)

Reference Books

- 1 **D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007**
- 2 **J .B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991**

Course Content

Unit I Introduction to healthcare delivery system 8 hours Healthcare delivery system in India at primary, secondary and tertiary care Community participation in healthcare delivery system Health system in developed countries. Private Sector National Health Mission National Health Policy Issues in Health Care Delivery System in India National Health Programme-Background, action plan, targets, operations, achievements and constraints in various National Health Programme.	
Unit II: Introduction to AYUSH system of medicine Introduction to Ayurveda. Yoga and Naturopathy Unani Siddha Homeopathy Need for integration of various system of medicine	8 hours
Unit III: Health scenario of India 8 hours Health scenario of India- past, present and future Demography & Vital Statistics- Demography – its concept Vital events of life & its impact on demography Significance and recording of vital statistics Census & its impact on health policy	
Unit IV : Epidemiology hours Principles of Epidemiology Natural History of disease Methods of Epidemiological studies	8
Unit V: Miscellaneous topics Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.	8 hours
Unit VI 8 hours Advancements in Indian Medicine & Telemedicine Telemedicine and its branches Advances in telemedicine Telemedicine & healthcare	

COURSE PLAN: (Total: 15 hours)

Topics to be covered under the subject are as follows:

1. Introduction to healthcare delivery system
 - 1.1 Healthcare delivery system in India at primary, secondary and tertiary care
 - 1.2 Community participation in healthcare delivery system
 - 1.3 Health system in developed countries.
 - 1.4 Private Sector
 - 1.5 National Health Mission
 - 1.6 National Health Policy
 - 1.7 Issues in Health Care Delivery System in India
2. National Health Programme-Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme.
3. Introduction to AYUSH system of medicine
 - 3.1 Introduction to Ayurveda.
 - 3.2 Yoga and Naturopathy
 - 3.3 Unani
 - 3.4 Siddha
 - 3.5 Homeopathy
 - 3.6 Need for integration of various system of medicine
4. Health scenario of India- past, present and future
5. Demography & Vital Statistics-
 - 5.1 Demography – its concept
 - 5.2 Vital events of life & its impact on demography
 - 5.3 Significance and recording of vital statistics
 - 5.4 Census & its impact on health policy
6. Epidemiology
 - 6.1 Principles of Epidemiology
 - 6.2 Natural History of disease
 - 6.3 Methods of Epidemiological studies
 - 6.4 Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Course Code: BOPT4014	Artificial Intelligence and it's Application	L	T	P	C
Version:	Date of Approval:	1	0	0	1
Pre-requisites//Exposure					
co-requisites					

Course Objectives

1. To study the fundamental concepts, principles and techniques employed in Artificial Intelligence and expert systems
2. To study the concepts of intelligent searching, knowledge and reasoning, planning, learning
3. To study the concepts of AI algorithms and their performance

Course Outcomes

At the end of this course students will be able to:

1. Describe the modern view of AI as the study of agents that receive and perceive from the Environment and perform actions
2. Demonstrate awareness of informed search and exploration methods
3. Explain about AI techniques for knowledge representation, planning and uncertainty Management.
4. Develop knowledge of decision making and learning methods
5. Explain the concept of Expert Systems

Course Description

The course is intended to provide knowledge on neural networks and algorithms in real time applications.

Text Books

1. Stuart Russell and Peter Norvig Artificial Intelligence - A Modern Approach, Prentice Hall, 3rd edition, 2011.
2. Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.
3. Elaine Ric, Kevin Knight and Shiv Shankar B. Nair, Artificial Intelligence, 3rd edition, Tata McGraw Hill, 2009.
4. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", 6th edition, Pearson, 2008.
5. Donald A. Waterman, 'A Guide to Expert Systems', Pearson Education.

Course Content

Unit I: INTRODUCTION

History, Environment - Basic Problem Solving Agents - Intelligent agents, Problem and Search - Solving agents, Searching strategies - Uninformed Search, Informed Search - , Local searching strategies, Adversarial search - Optimal and imperfect decisions - Alpha, Beta pruning.

Unit II: KNOWLEDGE AND REASONING

Logic Agents: Concepts and Logic Programming: Propositional Calculus, Propositional Logic, First Order Logic - Syntax and semantics - Inference in first order logic, Predicate Logic, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network.

Unit III: UNCERTAIN KNOWLEDGE AND REASONING

Uncertainty - Acting under uncertainty - Basic probability notation - Axioms of probability - Baye's rule - Probabilistic reasoning - Making simple decisions

Unit IV: PLANNING AND LEARNING

Planning: Planning problem - Partial order planning - Planning and acting in non-deterministic domains - Learning: Learning decision trees - Knowledge in learning - Neural networks - Reinforcement learning - Passive and active

Unit V: EXPERT SYSTEMS

Definition - Features of an expert system - Organization - Characteristics - Knowledge Representation in expert systems - acquisition - Perception and Action - Real time search, Expert system tools.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	COMPUTER FANDAMENTALS(B.C. & I.S.)			
Course Code	COMP1111			
Prerequisite				
Corequisite				
Ant requisite				
	L	T	P	C
	3	0	0	3

Course Objective:

The students will be able to appreciate the role of computer technology and some extent able to gain hand-on experience in using computers.

The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should be able to appreciate the role of computer technology
CO2	Students should be able to gain hand-on experience in using computers
CO3	Students should get the basic knowledge about the computer technologies in india
CO4	Students should able to understand the Concept behind it
CO5	Students should able to utilise knowledge in treatment of Eye

Text Books

- 1 Computer Technology. Joney & Bartlett learning, 2014

Reference Books

- 1 Computers fundamentals, Lippincott Williams and Wilkins,1991

Course Content

Unit I Introduction	8
hours 1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. 2. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems). 3. Processor and memory: The Central Processing Unit (CPU), main memory.	
Unit II: Introduction to Storage Device	8 hours
Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. 5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).	
Unit III: Introduction to MS-Word	8
hours Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. 7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.	
Unit IV : Introduction to power-point:	
8 hours Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. 9. Introduction of Operating System: introduction, operating system concepts, types of operating system. 10. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network	
Unit V: Internet and its Applications	8 hours
Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. 12. Application of Computers in clinical settings.	

COURSE PLAN: (Total: 15 hours) – students will be given hand-on practical sessions and reading materials (softcopy). Some of the topics will be demonstration.

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).
6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.
10. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
12. Application of Computers in clinical settings.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Clinical Optometry-II (VO Lab-I)			
Course Code	BOPT3054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

The objective of this course is to

This course deals with the concept of eye as an optical instrument and thereby covers various optical components of eye, types of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students will able to understand the fundamental of optical components of eye
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TEXT BOOK:

- 1 A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
- 2 AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998

REFERENCE BOOKS:

1. Loshin D. S. **The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.**
2. Schwartz S. H. **Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.**

List of Experiments

- 1 To study and understand the reflecting and refracting surfaces
- 2 To study and understand Aberrations and eye
- 3 To study about interference, diffraction
- 4 To study and understand about Optical constants of eye
- 5 To study and understand about Etiology, correction of Myopia
- 6 To study and understand about Etiology, correction of hypermetropia
- 7 To study and understand about Etiology, correction of Astigmatism
- 8 To study about Schematic, reduced eye
- 9 To study about subjective refraction techniques and advancements

Total: 45 hours Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a registered optometrist. Students are tested on intermediate clinical optometry skills. The practical aspects of the dispensing optics(hand-on in optical), optometric instruments, clinical examination of visual system(Hands-on under supervision) and ocular diseases (Slides and case discussion) will be given to the students during their clinical training.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Clinical Optometry-II(OI Lab-1)			
Course Code	BOPT3055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

The objective of this course is to

This course covers commonly used optometric instruments, its basic principle, description and usage in clinical practice.

Course Outcomes

At the end of the course, students will be able to:

CO1	student should be able to gain theoretical knowledge and basic practical skill in handling the following instruments
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TEXT BOOK:

1 David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991

REFERENCE BOOKS:

1. P R Yoder: Mounting Optics in Optical Instruments, SPIE Society of Photo- Optical Instrumentation, 2002

2. G Smith, D A. Atchison: The Eye and Visual Optical Instruments, Cambridge University Press, 1997

List of Experiments

- 1 To perform the calibration of optometric instrument and appliances of lensometer
- 2 To study and perform the experiment of optometric instrument and appliances of tonometer
- 3 To study and perform the experiment of optometric instrument and appliances of slitlamp
- 4 To study and perform the experiment of optometric instrument and appliances of colour vision tests
- 5 To study and perform the experiment of optometric instrument and appliances of placido disc
- 6 To study and perform the experiment of optometric instrument and appliances of keratometer
- 7 To study and perform the experiment of optometric instrument and appliance of retinoscopy

Total: 45 hours Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a registered optometrist. Students are tested on intermediate clinical optometry skills. The practical aspects of the dispensing optics(hand-on in optical), optometric instruments, clinical examination of visual system(Hands-on under supervision) and ocular diseases (Slides and case discussion) will be given to the students during their clinical training.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Clinical Optometry-II(OD Lab-I)			
Course Code	BOPT3056			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives

The objective of this course is to

This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should able to understand the etiology,Epidemiology,signs,Symptoms,ocular sequence,diagnostic approach and management of ocular diseases
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TEXT BOOK:

- 1 A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007**

REFERENCE BOOKS:

- 1. Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990**
- 2. Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007**

List of Experiments

- 1 Diagnosis & management of orbital diseases
- 2 Diagnosis & management of Eyelid & Eye lashes diseases
- 3 Diagnosis & management of lacrimal diseases(Tears & Canal)
- 4 Diagnosis & management of conjunctival Disease(Bacterial, Fungal, Viral, Protozoa, Helminth)
- 5 Diagnosis & management of conjunctival Disease(Pinguecula & Pterigium)
- 6 Diagnosis & management of corneal disease
- 7 Diagnosis & management of scleritis and episcleritis
- 8 Diagnosis & management of Aqueous Humor disease
- 9 Diagnosis & management of Cataract
- 10 Experiment on recent advancements in Ocular Disease

Total: 45 hours Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a registered optometrist. Students are tested on intermediate clinical optometry skills. The practical aspects of the dispensing optics(hand-on in optical), optometric instruments, clinical examination of visual system(Hands-on under supervision) and ocular diseases (Slides and case discussion) will be given to the students during their clinical training.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	COMPUTER FANDAMENTALS LAB (Ex & Ppt)			
Course Code	COMP1112			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

Course Outcomes

At the end of the course, students will be able to:

CO1	The students will be able to appreciate the role of computer technology and some extent able to gain hand-on experience in using computers.
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Text Books

- 1 Computer Technology. Joney & Bartlett learning, 2014

Reference Books

- 1 Computers fundamentals, Lippincott Williams and Wilkins,1991

List of Experiments

- 1 Introduction to computer:
- 2 Introduction to . Input output devices
- 3 Introduction to Storage Devices:
- 4 Introduction to MS-Word
- 5 Introduction to power-point
- 6 Introduction to Internet and its Applications

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	OPTOMETRIC OPTICS II & DISPENSING OPTICS			
Course Code	BOPT4001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

This course deals with understanding the theory behind spectacle lenses and frames, their materials, types, advantages and disadvantages, calculations involved, when and how to prescribe. It will impart construction, design application and development of lenses, particularly of the methods of calculating their power and effect. In addition deals with role of optometrists in optical set-up..

Skills/knowledge to be acquired at the end of this course:

1. To select the tool power for grinding process
2. Different types of materials used to make lenses and its characteristics
3. Lens designs–Bifocals, progressive lens
4. Tinted, Protective & Special lenses
5. Spectacle frames –manufacture process & materials
6. Art and science of dispensing spectacle lens and frames based on the glass prescription.
7. Reading of spectacle prescription. Counselling the patient
8. Lens edge thickness calculation
9. Frame & lens measurements and selection
10. Writing spectacle lens order
11. Facial measurements - Interpupillary distance measurement and measuring heights (single vision, multifocal, progressives)
12. Lens verification and axis marking and fitting of all lens types
13. Final checking of finished spectacle with frame adjustments
14. Delivery and follow-up
15. Troubleshooting complaints and handling patient's questions

Course Outcomes

CO1	Students should understand about the instruments and the procedure for processing lenses before fitting
CO2	Students should able to differentiate between different types of lenses
CO3	Students should able to understand the frame measurements and essential fitting measurements
CO4	Students should able to understand the process of quality check and trouble shooting
CO5	Students should understand the different types of tints and different selective lenses

Text Book

1. Jalie MO: Ophthalmic lens and Dispensing, 3rd edition, Butterworth –Heinemann, 2008
2. Troy E. Fannin, Theodore Grosvenor: Clinical Optics, 2nd edition, Butterworth – Heinemann, 1996
3. C W Brooks, IM Borish: System for Ophthalmic Dispensing, 3rd edition, Butterworth - Heinemann, 2007
4. Michael P Keating: Geometric, Physical & Visual Optics, 2nd edition, Butterworth – Heinemann, 2002

Reference Book (s)

- 1 **Ophthalmic Dispensing, Second edition, ButterworthHeinemann, USA, 1996**
- 2 Geometrical Optics, Physical Optics & Ocular Physiology, Optometric Optics - I

Course Content

Unit-1 Spectacle Lenses - II:

8 hours

Manufacture of glass

- Lens materials
- Lens surfacing
- Principle of surface generation and glass cements
- Terminology used in Lens workshop
- Lens properties • Lens quality
- Faults in lens material • Faults on lens surface
- Methods of Inspecting the quality of lenses
- Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others)

Spectacle Frames:

- Types and parts
- Classification of spectacle frames-material, weight, temple position, Coloration
- Frame construction • Frame selection
- Size, shape, mounting and field of view of ophthalmic lenses

Tinted & Protective Lenses

- Characteristics of tinted lenses Absorptive Glasses
- Polarizing Filters, Photochromic & Reflecting filters
- Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses

Unit-2 Multifocal Lenses:

8 hour

Introduction, history and development, types

- Bifocal lenses, Trifocal & Progressive addition lenses

Reflection from spectacle lens surface & lens coatings:

- Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line
- Antireflection coating, Mirror coating, Hard Multi Coating [HMC],

Hydrophobic coating

Miscellaneous Spectacle:

- Iseikonic lenses

- Spectacle magnifiers
- Recumbent prisms
- Fresnel prism and lenses
- Lenticular & Aspherical lenses
- High Refractive index glasses

Unit-3 Spectacle

8 hour

1. Components of spectacle prescription & interpretation, transposition, Add and near power relation
2. Frame selection –based on spectacle prescription, professional requirements, age group, face shape
3. Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height
4. Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments –facial wrap, pantoscopic tilt

Unit-4 Optical devices

8 hour

- Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)
6. Neutralization –Hand & lensometer, axis marking, prism marking
 7. Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)
 8. Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories –Bands, chains, boxes, slevets, cleaners, screwdriver kit

Unit-5 Spectacle repair

hour

Spectacle repairs –tools, methods, soldering, riveting, frame adjustments

10. Special types of spectacle frames
 - Monocles
 - Ptosis crutches
 - Industrial safety glasses
 - Welding glasses
12. Frame availability in Indian market
13. FAQ's by customers and their ideal answers

8

Unit-5 Recent Advancement

hour

Dispensing Optician

Raising the standards and profile of the optician profession across the globe

New technologies and diagnostic tools in Optometry

8

Sl. No	Topics	No. of Hrs
1.	Spectacle Lenses - II: <ul style="list-style-type: none"> • Manufacture of glass • Lens materials • Lens surfacing • Principle of surface generation and glass cements • Terminology used in Lens workshop • Lens properties • Lens quality • Faults in lens material • Faults on lens surface • Methods of Inspecting the quality of lenses • Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others) 	5
2.	Spectacle Frames: <ul style="list-style-type: none"> • Types and parts • Classification of spectacle frames-material, weight, temple position, Coloration • Frame construction • Frame selection • Size, shape, mounting and field of view of ophthalmic lenses 	5
3.	Tinted & Protective Lenses <ul style="list-style-type: none"> • Characteristics of tinted lenses Absorptive Glasses • Polarizing Filters, Photochromic & Reflecting filters • Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses 	5
4.	Multifocal Lenses: <ul style="list-style-type: none"> • Introduction, history and development, types Bifocal lenses, Trifocal & Progressive addition lenses	3
5.	Reflection from spectacle lens surface & lens coatings: <ul style="list-style-type: none"> • Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line • Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating 	2
6.	Miscellaneous Spectacle: <ul style="list-style-type: none"> • Iseikonic lenses • Spectacle magnifiers • Recumbent prisms • Fresnel prism and lenses • Lenticular & Aspherical lenses • High Refractive index glasses 	5
	Total number of hours	25

Dispensing Optics

Sl. No.	Topic	No. of Lectures
1	Components of spectacle prescription & interpretation, transposition, Add and near power relation	1
2	Frame selection –based on spectacle prescription, professional requirements, age group, face shape	4
3	Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height	1
4	Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments –facial wrap, pantoscopic tilt	1
5	Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)	1
6	Neutralization –Hand & lensometer, axis marking, prism marking	3
7	Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)	2
8	Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories –Bands, chains, boxes, sleeves, cleaners, screwdriver kit	2
9	Spectacle repairs –tools, methods, soldering, riveting, frame adjustments	1
10	Special types of spectacle frames <ul style="list-style-type: none"> ➤ Monocles ➤ Ptosis crutches ➤ Industrial safety glasses ➤ Welding glasses 	1
12	Frame availability in Indian market	1
13	FAQ's by customers and their ideal answers	2
	Total number of Hours	20

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	VISUAL OPTICS - II			
Course Code	BOPT4002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: Upon completion of the course, the student should be able:

1. To understand the fundamentals of optical components of the eye
2. To gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

Course Outcomes

CO1	Students should be able to understand the fundamentals of optical components of the eye
CO2	Student should be able to gain the theoretical knowledge on the measurement of visual acuity
CO3	Student should be able to correlate the skill on visual acuity measurement
CO4	Student should be able to understand the objective clinical refraction
CO5	Students should be able to understand the subjective clinical refraction

Text Book

1. Theodore Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinemann, 2007
2. Duke –Elder's practice of Refraction
3. AI Lens: Optics, Retinoscopy, and Refractometry: 2nd edition, SLACK Incorporated (p) Ltd, 2006
4. George K. Hans, Kenneth Cuiffreda: Models of the visual system, Kluwer Academic, NY, 2002
5. Leonard Werner, Leonard J. Press: Clinical Pearls in Refractive Care, Butterworth – Heinemann, 2002
6. David B. Elliot: Clinical Procedures in Primary Eye care, 3rd edition, Butterworth – Heinemann, 2007
7. WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006

Reference Book (s)

1. M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002
2. Michael P Keating: Geometric, Physical & Visual Optics, 2nd edition, Butterworth – Heinemann, 2002
3. WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006
4. HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.

Course Content

Unit-1 Accommodation & Presbyopia

8 hours

Far and near point of accommodation

- Range and amplitude of accommodation
- Mechanism of accommodation
- Variation of accommodation with age
- Anomalies of accommodation
- Presbyopia
- Hypermetropia and accommodation

Unit-2 Convergence:

8

hour

Type, Measurement and Anomalies

- Relationship between accommodation and convergence-AC/A ratio

Unit-3 Objective Refraction

8 hour

Streak retinoscopy

- Principle, Procedure, Difficulties and interpretation of findings
- Transposition and spherical equivalent
- Dynamic retinoscopy various methods
- Radical retinoscopy and near retinoscopy
- Cycloplegic refraction

Unit-4 Subjective Refraction 8 hour

- Principle and fogging
- Fixed astigmatic dial (Clock dial), Combination of fixed and rotator dial (Fan and block test), J.C.C
- Duochrome test
- Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging
- Binocular refraction-Variou techniques

Unit-5 Effective Power & Magnification 8 hour

- Ocular refraction vs. Spectacle refraction
- Spectacle magnification vs. Relative spectacle magnification
- Axial vs. Refractive ametropia, Knapp's law

Unit VI Ocular optics

Optical system of the eye (Corneal and Lenticular system)

Catoptric images (principle and utility of Purkinje's image in keratometry and pachymetry)

Optical and Chromatic aberrations

. Anisometropia and Aniseikonia

Course Plan

Sl. No	Topics	No. of Hrs
1.	Accommodation & Presbyopia <ul style="list-style-type: none"> • Far and near point of accommodation • Range and amplitude of accommodation • Mechanism of accommodation • Variation of accommodation with age • Anomalies of accommodation • Presbyopia • Hypermetropia and accommodation 	6

2.	Convergence: <ul style="list-style-type: none"> • Type, Measurement and Anomalies • Relationship between accommodation and convergence-AC/A ratio 	3
3.	Objective Refraction (Static & Dynamic) <ul style="list-style-type: none"> • Streak retinoscopy • Principle, Procedure, Difficulties and interpretation of findings • Transposition and spherical equivalent • Dynamic retinoscopy various methods • Radical retinoscopy and near retinoscopy • Cycloplegic refraction 	8
4.	Subjective Refraction: <ul style="list-style-type: none"> • Principle and fogging • Fixed astigmatic dial (Clock dial), Combination of fixed and rotator dial (Fan and block test), J.C.C • Duochrome test <ul style="list-style-type: none"> ○ Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging ○ Binocular refraction- Various techniques 	8
5.	Effective Power & Magnification : <ul style="list-style-type: none"> • Ocular refraction vs. Spectacle refraction • Spectacle magnification vs. Relative spectacle magnification • Axial vs. Refractive ametropia, Knapp's law • Ocular accommodation vs. Spectacle accommodation • Retinal image blur-Depth of focus and depth of field 	5
Total number of hours		30

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	PATHOLOGY			
Course Code	BOPT4004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective: At the end of the course students will acquire knowledge in the following aspects:

1. Inflammation and repair aspects.
2. Pathology of various eye parts and adnexa.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should understand difference between an infection and inflammation
CO2	students should able to acquire knowledge on signs and associated symptoms exhibited by different disease conditions
CO3	students should able to understand the pathology of specific infections of the systemic health
CO4	students should understand the circulatory disturbances associated with different disease conditions
CO5	students should able to understand the body immunity and allergies associated with immune breakdown

Text Book

1. K S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997

Reference Books

- 1 **Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990**
- 2 **CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, New Delhi, 2004.**
- 3 **S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease,1993.**

Course Content

Unit I: INFECTION Inflammation and repair Infection in general	6 hours
Unit II: Specific Infection Tuberculosis Leprosy Syphilis Fungal infection Viral chlamydial infection	6 hours
Unit III: □ Neoplasia 6 hours Hematology Anemia Leukemia Bleeding disorders.	
Unit IV :Circulatory disturbances Thrombosis Infarction Embolism Clinical pathology Interpretation of urine report Interpretation of blood smears.	6 hours
Unit V: Immune system □ Immune system Shock, Anaphylaxis. Allergy	6 hours
Unit :VI Research advancements in Pathology New investigative methods of pathology Latest and high impact journals of pathology	6 hours

COURSE PLAN (Total: 15 hours)

1. Inflammation and repair
2. Infection in general
3. Specific infections
 - 3.1 Tuberculosis
 - 3.2 Leprosy
 - 3.3 Syphilis
 - 3.4 Fungal infection
 - 3.5 Viral chlamydial infection
4. Neoplasia
5. Hematology
 - 5.1 Anemia
 - 5.2 Leukemia
 - 5.3 Bleeding disorders
6. Circulatory disturbances
 - 6.1 Thrombosis
 - 6.2 Infarction
 - 6.3 Embolism
7. Clinical pathology
 - 7.1 Interpretation of urine report
 - 7.2 Interpretation of blood smears.
8. Immune system
9. Shock, Anaphylaxis.
10. Allergy

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	BASIC AND OCULAR PAHARMOCOLGY			
Course Code	BOPT4005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective: At the end of the course the students will acquire knowledge in the following aspects-

1. Basic principle of pharmacokinetics & Pharmacodynamics
2. Commonly used ocular drugs, mechanism, indications, contraindications, drug dosage and adverse effects.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should understand the basic principles of pharmacokinetics and pharmacodynamics
CO2	students should able to aquire knowledege on types of ocular drugs and their mechanisms
CO3	students should able to understand the indications and contraindications of ocular drugs
CO4	students should understand the drug dosate and roots of administration
CO5	students should aquire the knowledge on adverse effects

Text Book

1. K D Tripathi: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004
2. Ashok Garg: Manual of Ocular Therapeutics, Jaypee, New Delhi, 1996

Reference Books

1. T J Zimmerman, K S Kooner : Text Book of Ocular Pharmacology, Lippincott-Raven, 1997

Course Content

Unit I: General Pharmacology	8 hours
General Pharmacology: Introduction & sources of drugs, Routes of drug administration, Pharmacokinetics (emphasis on ocular pharmacokinetics), Pharmacodynamics & factors modifying drug actions	
Unit II: Systemic Pharmacology	8 hours
Autonomic nervous system: Drugs affecting papillary size and light reflex, Intraocular tension, Accommodation; Cardiovascular system: Antihypertensive sand drugs useful in Angina; Diuretics: Drugs used in ocular disorders; Central Nervous System: Alcohol, sedative hypnotics, General & local anaesthetics, Opioids & non-opioids; Chemotherapy : Introduction on general chemotherapy, Specific chemotherapy –Antiviral, antifungal, antibiotics; Hormones : Corticosteroids, Antidiabetics; Blood Coagulants	
Unit III: Ocular Pharmacology	8 hours

Ocular preparations, formulations and requirements of an ideal agent; Ocular Pharmacokinetics, methods of drug administration & Special drug delivery system; Ocular Toxicology	
Unit IV :Diagnostic Test	8 hours
Diagnostic & Therapeutic applications of drugs used in Ophthalmology: Diagnostic Drugs & biological agents used in ocular surgery, Anaesthetics used in ophthalmic procedures, Anti-glaucoma drugs;	
Unit V: Pharmacotherapy of ocular infections	8 hours
Bacterial, viral, fungal & chlamydial; Drugs used in allergic, inflammatory& degenerative conditions of the eye; Immune modulators in Ophthalmic practice, Wetting agents & tear substitutes ,Antioxidants .	
Unit VI- Recent advances	8 hours
Newer generations of eye drug	
The market availability in India	
Comparative research work done to see the effectivity of drug in experimental vs control group	
Placebo effect	

COURSE PLAN

Sl. No	Topics	No. of Hrs
1.	General Pharmacology: Introduction & sources of drugs, Routes of drug administration, Pharmacokinetics (emphasis on ocular pharmacokinetics), Pharmacodynamics & factors modifying drug actions	10
2.	Systemic Pharmacology: Autonomic nervous system: Drugs affecting papillary size and light reflex, Intraocular tension, Accommodation; Cardiovascular system: Anti-hypertensive sand drugs useful in Angina; Diuretics: Drugs used in ocular disorders; Central Nervous System: Alcohol, sedative hypnotics, General & local anaesthetics, Opioids & non-opioids; Chemotherapy : Introduction on general chemotherapy, Specific chemotherapy –Antiviral, antifungal, antibiotics; Hormones : Corticosteroids, Antidiabetics; Blood Coagulants	10
3.	Ocular Pharmacology: Ocular preparations, formulations and requirements of an ideal agent; Ocular Pharmacokinetics, methods of drug administration & Special drug delivery system; Ocular Toxicology	10
4.	Diagnostic & Therapeutic applications of drugs used in Ophthalmology: Diagnostic Drugs & biological agents used in ocular surgery, Anaesthetics used in ophthalmic procedures, Anti-glaucoma drugs; Pharmacotherapy of ocular infections –Bacterial, viral, fungal & chlamydial; Drugs used in allergic, inflammatory& degenerative conditions of the eye; Immune modulators in Ophthalmic practice, Wetting agents & tear substitutes ,Antioxidants	15
	Total number of hours	45

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	HEALTH CARE ORGANISATION			
Course Code	BOPT4008			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective:

The objective of the course is to:

Health Care Management provides a framework for addressing management problems in health care organizations. By the end of the course you will have been exposed to many management ideas, theories and applications

Course Outcomes

At the end of the course, students will be able to:

CO1	To understand the structure and functions of different departments of a hospital and health care organization
CO2	To develop skills in planning, building and managing hospitals and health care.
CO3	To make familiarize students with concepts and techniques of Modern Management in different health care units.
CO4	To understand the organizational vision and missions to be followed to achieve it
CO5	To understand management of medical records

Text Book

- 1. Health Sector Reform in Developing Countries - Peter Berman, Harvard University Press, 1995.**
- 2. Health Policy and Management - The health care Agenda in a British political context - column Paton, 1996, Chapman & Hall Publication (Madras).**

Reference Books

- 1. Health Planning For Effective Management - William A. Reinke, 1988, Oxford University Press.**

Course Content

Unit I: Introduction	8 hours
Concept of Hospitals - Planning and Design of a Hospital (Building & Physical Layout) - space Required for Separate Functions - Different types of Hospitals - Problems and constrains in different type of Hospitals - History of Hospital Development - Departmental and organization structure of different types of hospitals.	

Unit II: Departments in a Hospital	8 hours
Organization - Structure - Vertical & Horizontal - Clinical & Non - clinical - supportive & Ancillary Service Departments –optical clinic-multinational-eye camp(PHC-secondary-Tertiary).	
Unit III: Management & Organisation of Clinical services	8 hours
Organization and Administration of various clinical services – Outpatient service - Inpatient Services - Emergency Services - Operation Theater - ICUs - super Specialty Service including their utilization study - Nursing Care and Ward Management.	
Unit IV Organisation & management of Utilities services	8 hours
Organizing and Managing Facility Support Services - Laundry - Housekeeping - Pest control managing the Estate (Hospital Security) - Recent trends in disaster Management - Hospital Engineering Services (Plumbing, electricity, Civil, A/c, LiÖs)- Ambulance Service.	
Unit V: Evaluation of Hospital & Health services	8 hours
Accreditation - Setting of objective - Health indicators - applying Economic concepts to Service Evaluation - Assessing Patient Satisfaction - Techniques of Hospital Service Evaluation - Indicators of Hospital Efficiency and Effectiveness - Evaluation of Quality of Hospital Services - Management of Hazard and Safety in a Hospital Setup - Nursing Services in a Hospital - current - Issues in Hospital Management	
Unit VI Eye banking	
Publicity	
How to donate your eyes	
Collection of donor eyes	
Preservation of eyes	
Preoperative & post operative instructions	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	OCULAR DISEASES -II & Glaucoma			
Course Code	BOPT4010			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objective: At the end of the course the students will be knowledgeable in the following aspects of ocular diseases: knowledge on

1. Etiology
2. Epidemiology
3. Symptoms
4. Signs
5. Course sequelae of ocular disease
6. Diagnostic approach, and
7. Management of the ocular diseases.

This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should understand the etiology and etiology of refractive errors and the correlation with ocular diseases
CO2	Students should able to differentiate between signs and symptom inorder to reach to the diagnosis
CO3	Students shoould able to understand the course sequence of ocular diseases
CO4	Students should understand the diagnostic approach to make the final diagnosis
CO5	Students should able to understand the management of ocular diseases

Text Book

- 1 Clinical Ophthalmology a systamatic approach by Jack J kanski 8th edition
- 2 A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Reference Books

- 3 **Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990**
- 4 **Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007**

Course Content

Unit I: Retina and Vitreous:

8 hours

- Applied Anatomy
- Congenital and Developmental Disorders (Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery)
- Inflammatory disorders (Retinitis : Acute purulent , Bacterial, Virus, mycotic)
- Retinal Vasculitis (Eales's)
- Retinal Artery Occlusion (Central retinal Artery occlusion)
- Retinal Vein occlusion (Ischaemic, Non Ischaemic , Branch retinal vein occlusion)
- Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations
- Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration.
- Retinal Detachment: Rhegmatogenous, Tractional, Exudative)
- Retinoblastoma
- Diabetic retinopathy

Unit II: Ocular Injuries

8

hours

Terminology : Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, perforating injury)

- Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis)
- Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational)
- Clinical approach towards ocular injury patients

Unit III: Lens

8 hours

- Applied Anatomy and Physiology
- Clinical examination
- Classification of cataract
- Congenital and Developmental cataract
- Acquired (Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic)
- Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar.
- Management of cataract (Non-surgical and surgical measures; preoperative evaluation, Types of surgeries,)
- Complications of cataract surgery
- Displacement of lens: Subluxation, Displacement
- Lens coloboma, Lenticonus, Microspherophakia.

Unit IV : Clinical Neuro-ophthalmology

8 hours

- Anatomy of visual pathway
- Lesions of the visual pathway
- Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil. Argyll Robertson pupil, Adie's tonic pupil)

<input type="checkbox"/> Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy • Cortical blindness <input type="checkbox"/> Malingering <input type="checkbox"/> Nystagmus <input type="checkbox"/> Clinical examination
Unit V: Glaucoma 8 hours <input type="checkbox"/> Applied anatomy and physiology of anterior segment <input type="checkbox"/> Clinical Examination <input type="checkbox"/> Definitions and classification of glaucoma <input type="checkbox"/> Pathogenesis of glaucomatous ocular damage <input type="checkbox"/> Congenital glaucoma's <input type="checkbox"/> Primary open angle glaucoma <input type="checkbox"/> Ocular hypertension <input type="checkbox"/> Normal Tension Glaucoma <input type="checkbox"/> Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure) <input type="checkbox"/> Secondary Glaucoma's <input type="checkbox"/> Management : common medications, laser intervention and surgical techniques
Unit V: Recent Advancements in Ocular diseases 8 hours <input type="checkbox"/> Recent advancements in Ocular diseases <input type="checkbox"/> Recent advancements in Ocular diseases diagnostic techniques <input type="checkbox"/> Recent advancements in Ocular diseases management

Course Plan

Sl. No	Topics	No. of Hrs
1.	Retina and Vitreous: <ul style="list-style-type: none"> • Applied Anatomy • Congenital and Developmental Disorders (Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery) • Inflammatory disorders (Retinitis : Acute purulent , Bacterial, Virus, mycotic) • Retinal Vasculitis (Eales's) • Retinal Artery Occlusion (Central retinal Artery occlusion) • Retinal Vein occlusion (Ischaemic, Non Ischaemic , Branch retinal vein occlusion) • Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations • Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration. • Retinal Detachment: Rhegmatogenous, Tractional, Exudative) • Retinoblastoma • Diabetic retinopathy 	12

2.	Ocular Injuries: Terminology : Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, perforating injury) <ul style="list-style-type: none"> • Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis) • Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational) • Clinical approach towards ocular injury patients 	3
3.	Lens <ul style="list-style-type: none"> • Applied Anatomy and Physiology • Clinical examination • Classification of cataract • Congenital and Developmental cataract • Acquired (Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic) • Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar. • Management of cataract (Non-surgical and surgical measures; preoperative evaluation, Types of surgeries,) • Complications of cataract surgery • Displacement of lens: Subluxation, Displacement • Lens coloboma, Lenticonus, Microspherophakia. 	10
4.	Clinical Neuro-ophthalmology <ul style="list-style-type: none"> • Anatomy of visual pathway • Lesions of the visual pathway • Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil, Argyll Robetson pupil, Adie's tonic pupil) • Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy • Cortical blindness • Malingering • Nystagmus Clinical examination	12
5.	Glaucoma <ul style="list-style-type: none"> • Applied anatomy and physiology of anterior segment • Clinical Examination • Definitions and classification of glaucoma • Pathogenesis of glaucomatous ocular damage • Congenital glaucoma's • Primary open angle glaucoma • Ocular hypertension • Normal Tension Glaucoma • Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure) • Secondary Glaucoma's • Management : common medications, laser intervention and surgical techniques 	8
Total number of hours		45

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	INTRODUCTION TO QUALITY & PATIENT SAFETY			
Course Code	BOPT4011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective: At the end of the course, students have gained introductory knowledge about quality and patient safety aspects from Indian perspectives.

This course deals with various aspects of quality and safety issues in health care services.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students gain the introductory knowledge about quality and patient safety from indian prespectivies
CO2	students would gather knowledge various aspects of medical psychology
CO3	students should coorelate and apply in the clinical scenario during the clinical postings
CO4	students should understand the ethics and safety aspects of clinical postings
CO5	students should able to coorelate the basic clinical knowledge with medical psychology

Text Book

- 1 Patricia Barkway. Psychology for health professionals, 2nd edition, Elsevier, 2013

Reference Books

- 2 Patricia Barkway. Psychology for health professionals, 2nd edition, Elsevier, 2013

Course Content

Unit I: Quality assurance and management hours	8
Quality assurance and management Basics of emergency care and life support skills	
Unit II: Waste Management	8 hours

Biomedical waste management and environment safety	
Infection and prevention control	
Unit III: Ocular Pharmacology	8 hours
Antibiotic resistance Disaster preparedness and management	
Unit IV : Psychology	8
hours	
Intelligence Learning, Memory, Personality, Motivation Body Integrity – one’s body image The patient in his Milen The self-concept of the therapist, Therapist-patient relationship – some guidelines Illness, its impact on the patient	
Unit V: Medical Psychology	8 hours
Maladies of the age and their impact on the patient’s own and others concept of his body image Adapting changes in Vision Why Medical Psychology demands commitment?.	
Unit VI: Recent Advancement	8 hours
Recent Advancement in Introduction to Quality & Patient safety Advances in Patient Safety: From Research to implementation Research findings Concepts and methodology Implementation issues Programs, Tools & products Recent Advances in Technology & Patient safety	

COURSE PLAN: (Total: 30 hours)

1. Quality assurance and management
2. Basics of emergency care and life support skills
3. Biomedical waste management and environment safety
4. Infection and prevention control
5. Antibiotic resistance
6. Disaster preparedness and management

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	MEDICAL PSYCHOLOGY			
Course Code	BOPT4012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objective: At the end of the course, the student would have gathered knowledge various aspects of medical psychology essential for him to apply in the clinical scenario during his clinical postings.

This course covers various aspects of medical psychology essential for the optometrist.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students gain the introductory knowledge about quality and patient safety from indianprespectivies
CO2	students would gather knowledge various aspects of medical psychology
CO3	students should coorelate and apply in the clinical scenario during the clinical postings
CO4	students should understand the ethics and safety aspects of clinical postings
CO5	students should able to coorelate the basic clinical knowledge with medical psychology

Text Book

- 3 Patricia Barkway. Psychology for health professionals, 2nd edition, Elsevier, 2013

Reference Books

- 4 Patricia Barkway. Psychology for health professionals, 2nd edition, Elsevier, 2013

Course Content

Unit I: Quality assurance and management	8 hours
Quality assurance and management Basics of emergency care and life support skills	
Unit II: Waste Management	8 hours

Biomedical waste management and environment safety	
Infection and prevention control	
Unit III: Ocular Pharmacology	
8 hours	
Antibiotic resistance	
Disaster preparedness and management	
Unit IV :Psychology	8 hours
Intelligence Learning, Memory, Personality, Motivation	
Body Integrity – one’s body image	
The patient in his Milen	
The self-concept of the therapist, Therapist-patient relationship – some guidelines	
Illness, its impact on the patient	
Unit V: Medical Psychology	8 hours
Maladies of the age and their impact on the patient’s own and others concept of his body image	
Adapting changes in Vision	
Why Medical Psychology demands commitment?.	
Unit VI Introduction to Counseling:	
Definition; Concept; Scope; Characteristics of a Good Counselor; Ethics in Counseling	

COURSE PLAN Total : 15 hours

1. Introduction toPsychology
2. Intelligence Learning, Memory, Personality,Motivation
3. Body Integrity – one’s bodyimage
4. The patient in hisMilen
5. The self-concept of the therapist, Therapist-patient relationship – someguidelines
6. Illness, its impact on thepatient
7. Maladies of the age and their impact on the patient’s own and others concept of his body image
8. Adapting changes inVision
9. Why Medical Psychology demandscommitment?

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	BASIC AND OCULAR PHARMACOLOGY - PRACTICAL			
Course Code	BOPT4054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:This course covers the actions, uses, adverse effects and mode of administration of drugs, especially related to eyes..

Course Outcomes

CO1	Students should acquire a knowledge on basic principles of pharmacokinetics and pharmacodynamics, drug dosage, indications, contraindications and adverse effects
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Text Book (s)

1. K D Tripathi: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004
2. Ashok Garg: Manual of Ocular Therapeutics, Jaypee, New Delhi, 1996

Reference Book (s)

1. T J Zimmerman, K S Kooner : Text Book of Ocular Pharmacology, Lippincott-Raven, 1997

List of Experiments	
1	Experiment to understand the procedure for installing cycloplegics and to see the effect of cycloplegics
2	Experiment to understand the procedure for installing mydriatics and see the effect of mydriatics
3	Experiment to understand the procedure for installing fluorescence dye and see the observe the uses of installing fluorescence dye in clinical set up
4	Experiment to understand the calibration and disinfection procedure for tonometer
5	Experiment to understand the calibration and disinfection of optometric devices
6	Experiment to understand various ways of disinfection of hands in clinical procedure
7	Experiment to explain about different types of ocular drug available and their indications, contraindications
8	Recent advancement in the field of Pharmacological research

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Clinical Optometry-III(OO & DO Lab)			
Course Code	BOPT4055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

Skills and knowledge to be aquired on right selection of frame and right selection of ophthalmic lens and delivery management

Course Outcomes

CO1	Skills and knowledge to be aquired on right selection of frame and right selection of ophthalmic lens and delivery management
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Text Book (s)

1. Jalie MO: Ophthalmic lens and Dispensing, 3rd edition, Butterworth –Heinemann, 2008
2. Troy E. Fannin, Theodore Grosvenor: Clinical Optics, 2nd edition, Butterworth – Heinemann, 1996
3. C W Brooks, IM Borish: System for Ophthalmic Dispensing, 3rdedition, Butterworth - Heinemann, 2007

Reference Book (s)

1. Michael P Keating: Geometric, Phisical& Visual Optics, 2nd edition, Butterworth – Heinemann, 2002

List of Experiments

- 1) **Experiment to understand the functions of various optometric instruments available in trail set**
- 2) **Experiment to analyse and evaluate the dioptric power of the spherocylindrical ophthalmic lens using Manual crossed-line tangent lensometer**
- 3) **Experiment to evaluate and quantify binocular PD**
- 4) **Experiment to evaluate and quantify the near PD**
- 5) **Experiment to measure the monocular PD using a sample frame**
- 6) **Experiment to measure subjectively checking sag height**
- 7) **Experiment to measure objectively checking sag height equality**
- 8) **Experiment to analyse and quantify the fitting height in case of a progressive lens**
- 9) **Experiment to analyse and quantify the Major reference point for a progressive lens**

Total Hours: 45 hours

Students will improve their skills in clinical procedures, and then progressive interactions with patients and professional personal are monitored as students practice optometry in supervised setting. Additional area includes problem solving and complications of various managements will be inculcated. Students should have exposure to eye bank facilities and must be made aware of eye donation, collection of eyes, preservation, pre and post-operative instructions and latest techniques for preservation of donor cornea. The students will get clinical training on the practical aspects of the following courses namely optometric optic –II & dispensing optics, visual optics – II and ocular disease -II.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Clinical Optometry-III(VO Lab-II)			
Course Code	BOPT4056			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: This course deals with the concept of eye as an optical instrument and thereby covers different optical components of eye, types of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

Course Outcomes

CO1	Students should able to understand the fundamental of optical components of eye and to gain knowledge and practical skills on visual acuity measurement, objective and subjective clinical refraction
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Text Book (s)

1. Theodore Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinemann, 2007
2. AI Lens: Optics, Retinoscopy, and Refractometry: 2nd edition, SLACK Incorporated (p) Ltd, 2006
3. George K. Hans, Kenneth Cuiffreda: Models of the visual system, Kluwer Academic, NY, 2002
4. Duke –Elder’s practice of Refraction
5. C W Brooks, IM Borish: System for Ophthalmic Dispensing, 3rd edition, Butterworth - Heinemann, 2007

Reference Book (s)

1. Michael P Keating: Geometric, Physical & Visual Optics, 2nd edition, Butterworth – Heinemann, 2002
2. Leonard Werner, Leonard J. Press: Clinical Pearls in Refractive Care, Butterworth – Heinemann, 2002
3. WJ Benjamin: Borish’s clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006

List of Experiments	
1	Experiment to find out the normative NPC and NPA
2	Experiment to understand the method of dynamic retinoscopy
3	Experiment to understand the static retinoscopy
4	Experiment to understand procedure and method of duochrome test
5	Experiment to understand the procedure for ocular refraction
6	Experiment to understand the procedure for spectacle refraction
7	Experiment to understand the procedure and method of cycloplegic refraction
8	Experiment to understand the principle, purpose and procedure of fogging

Total Hours: 45 hours

Students will improve their skills in clinical procedures, and then progressive interactions with patients and professional personal are monitored as students practice optometry in supervised setting. Additional area includes problem solving and complications of various managements will be inculcated. Students should have exposure to eye bank facilities and must be made aware of eye donation, collection of eyes, preservation, pre and post-operative instructions and latest techniques for preservation of donor cornea. The students will get clinical training on the practical aspects of the following courses namely optometric optic –II & dispensing optics, visual optics – II and ocular disease -II.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Clinical Optometry-III(OD Lab-II)			
Course Code	BOPT4057			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

Course Outcomes

CO1	Students should able to acquire knowledge on etiology,epidemiology,symptoms,signs and diagnosis of various ocular diseases
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Text Book (s)

1. A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Reference Book (s)

1. Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
2. Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth- Heinemann, 2007
- 3.

List of Experiments	
1	Experiment to understand the procedure and investigation of retinal diseases
2	Experiment to understand the procedure and management of mechanical injuries
3	Experiment to understand the procedure and management of non-mechanical injuries
4	Experiment to understand the procedure and clinical examination of cataract
5	Experiment to understand the procedure and clinical examination of clinical neuro-ophthalmology
6	Experiment to demonstrate techniques to find out malingering
7	Experiment to determine and measure the degree of Strabismus
8	Experiments on recent advancements in Ocular diseases diagnosis & management

Total Hours: 45 hours

Students will improve their skills in clinical procedures, and then progressive interactions with patients and professional personal are monitored as students practice optometry in supervised setting. Additional area includes problem solving and complications of various managements will be inculcated. Students should have exposure to eye bank facilities and must be made aware of eye donation, collection of eyes, preservation, pre and post-operative instructions and latest techniques for preservation of donor cornea. The students will get clinical training on the practical aspects of the following courses namely optometric optic –II & dispensing optics, visual optics – II and ocular disease -II.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Contact Lens-1			
Course Code	BOPT5001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: Upon completion of the course, the student should be able to:

1. Understand the basics of contact lenses
2. List the important properties of contact lenses
3. Finalise the CL design for various kinds patients
4. Recognize various types of fitting
5. Explain all the procedures to patient
6. Identify and manage the adverse effects of contact lens

Course Outcomes

CO1	Explain and enlist the important properties of contact lenses
CO2	Explain summerise the contact lens design for various kinds patients
CO3	Explain and recognize various types of fitting
CO4	Explain all the procedures patient
CO5	Explain and identify and manage the adverse effects of contact lens

Text Book (s)

1. IACLE modules 1 - 10
2. CLAO Volumes 1, 2, 3
3. Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
4. Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004

Reference Book (s)

E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

<p>Unit-1 Introduction</p> <p>6 hours</p> <p>1. Introduction to Contact lenses</p> <p>1.1 Definition</p>
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1.2 Classification / Types

2. History of Contact Lenses

3. Optics of Contact Lenses

3.1 Magnification & Visual field

3.2 Accommodation & Convergence

3.3 Back & Front Vertex Power / Vertex distance calculation

4. Review of Anatomy & Physiology of

4.1 Tear film

4.2 Cornea

4.3 Lids & Conjunctiva

Unit-2

8 hours

5. Introduction to CL materials

5.1 Monomers, Polymers

6. Properties of CL materials

6.1 Physiological (Dk, Ionicity, Water content)

6.2 Physical (Elasticity, Tensile strength, Rigidity)

6.3 Optical (Transmission, Refractive index)

7. Indications and contraindications

8. Parameters / Designs of Contact Lenses & Terminology

Unit-3

9 hours

9. RGP Contact Lens materials

10. Manufacturing Rigid and Soft Contact Lenses – various methods

11. Pre-Fitting examination – steps, significance, recording of results

12. Correction of Astigmatism with RGP lens

13. Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses

14. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses

Unit-4

8 hours

15. Calculation and finalising Contact lens parameters

16. Ordering Rigid Contact Lenses – writing a prescription to the Laboratory

17. Checking and verifying Contact lenses from Laboratory

18. Modifications possible with Rigid lenses

19. Common Handling Instructions

19.1 Insertion & Removal Techniques

19.2 Do's and Dont's

Unit-5

9 hours

20. Care and Maintenance of Rigid lenses

20.1 Cleaning agents & Importance

20.2 Rinsing agents & Importance

20.3 Disinfecting agents & importance

20.4 Lubricating & Enzymatic cleaners

21. Follow up visit examination

22. Complications of RGP lenses

Unit-6

- Rose K lenses
- Ortho K lenses
- Therapeutic lenses
- Anti-bacterial contact lenses
- Drug delivery contact lenses
- Augmented reality contact lenses

COURSE PLAN (Total: 30 hours)

1. Introduction to Contact lenses
 - 1.1 Definition
 - 1.2 Classification / Types
2. History of Contact Lenses
3. Optics of Contact Lenses
 - 3.1 Magnification & Visual field
 - 3.2 Accommodation & Convergence
 - 3.3 Back & Front Vertex Power / Vertex distance calculation
4. Review of Anatomy & Physiology of
 - 4.1 Tear film
 - 4.2 Cornea
 - 4.3 Lids & Conjunctiva
5. Introduction to CL materials
 - 5.1 Monomers, Polymers
6. Properties of CL materials
 - 6.1 Physiological (Dk, Ionicity, Water content)
 - 6.2 Physical (Elasticity, Tensile strength, Rigidity)
 - 6.3 Optical (Transmission, Refractive index)
7. Indications and contraindications
8. Parameters / Designs of Contact Lenses & Terminology
9. RGP Contact Lens materials
10. Manufacturing Rigid and Soft Contact Lenses – various methods

11. Pre-Fitting examination – steps, significance, recording of results
12. Correction of Astigmatism with RGP lens
13. Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses
14. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses
15. Calculation and finalising Contact lens parameters
16. Ordering Rigid Contact Lenses – writing a prescription to the Laboratory
17. Checking and verifying Contact lenses from Laboratory
18. Modifications possible with Rigid lenses
19. Common Handling Instructions
 - 19.1 Insertion & Removal Techniques
 - 19.2 Do's and Dont's
20. Care and Maintenance of Rigid lenses
 - 20.1 Cleaning agents & Importance
 - 20.2 Rinsing agents & Importance
 - 20.3 Disinfecting agents & importance
 - 20.4 Lubricating & Enzymatic cleaners
21. Follow up visit examination
22. Complications of RGP lenses

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	LOW VISION AIDS & VISUAL REHABILITATION			
Course Code	BOPT5002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: At the end of the course, the student will be knowledgeable in the following:

1. Definition and epidemiology of Low Vision
2. Clinical examination of Low vision subjects
3. Optical, Non-Optical, Electronic, and Assistive devices.
4. Training for Low Vision subjects with Low vision devices
5. Referrals and follow-up

This course deal with the definition of low vision, epidemiology aspect of visual impairment, types of low vision devices and its optical principles, clinical approach of the low vision patients, assistive devices for totally visually challenged, art of prescribing low vision devices and training the low vision patients and other rehabilitation measures.

Course Outcomes

CO1	Students should understand the basic low vision clinical set up.
CO2	Students should be able to understand the clinical examination of low vision subjects
CO3	Student should be able to understand the optical, electronic and assistive devices
CO4	students should able to understand training of low vision subjects and assistive devices
CO5	Students should able to understand the making refferals and followup cases of low vision subject

TEXT BOOKS:

1. Christine Dickinson: Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998
2. Sarika G, Sailaja MVSE Vaithilingam: practice of Low vision –A guide book, Medical Research Foundation, 2015.

REFERENCE BOOKS:

1. Richard L. Brilliant: Essentials of Low Vision Practice, Butterworth-Heinemann, 1999
2. Helen Farral: optometric Management of Visual Handicap, Blackwell Scientific publications,

Course Content

Unit-1 Introduction 6 hours
. Definitions & classification of Low vision 2. Epidemiology of low vision 3. Model of low vision service
Unit-2 8 hours
4. Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psychosocial impact of low vision 5. Types of low vision aids – optical aids, non-optical aids & electronic devices
Unit-3 9 hours
6. Optics of low vision aids 7. Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training 8. Pediatric Low Vision care
Unit-4 9 hours
9. Low vision aids – dispensing & prescribing aspects 10. Visual rehabilitation & counseling
Unit-5 9 hours
11. Legal aspects of Low vision in India 12. Case Analysis
Unit-6 8 hours
Advancements in Low Vision Aids & Visual Rehabilitation Advances in optical low vision devices & its prescribing procedures Modern concepts of disability Innovative mobile technology

COURSE PLAN: (Total: 15 hours)

1. Definitions & classification of Low vision
2. Epidemiology of low vision
3. Model of low vision service
4. Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision
5. Types of low vision aids – optical aids, non-optical aids & electronic devices
6. Optics of low vision aids
7. Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training
8. Pediatric Low Vision care
9. Low vision aids – dispensing & prescribing aspects
10. Visual rehabilitation & counseling
11. Legal aspects of Low vision in India
12. Case Analysis

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	GERIATRIC & PAEDIATRIC OPTOMETRY			
Course Code	BOPT5003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: The student on taking this course should (Geriatric Optometry)

1. Be able to identify, investigate the age related changes in the eyes.
2. Be able to counsel the elderly
3. Be able to dispense spectacles with proper instructions.
4. Adequately gained knowledge on common ocular diseases.

At the end of the course the student is expected to: (Paediatric Optometry)

1. Have a knowledge of the principal theories of childhood development, and visual development
2. Have the ability to take a thorough paediatric history which encompasses the relevant developmental, visual, medical and educational issues
3. Be familiar with the accommodative-vergence system, the genesis of ametropia, the disorders of refraction, accommodation and vergence, and the assessment and management of these disorders
4. Be familiar with the aetiology, clinical presentation and treatment of amblyopia, comitant strabismus and commonly presenting incomitant strabismus
5. Have a knowledge of the epidemiology of eye disease in children, the assessment techniques available for examining visual function of children of all ages and an understanding varied management concepts of paediatric vision disorders
6. Have knowledge of the art of dispensing contact lens, low vision aids and referral to the surgeon or other specialists at the appropriate timing.
7. Have a capacity for highly evolved communication and co-management with other professionals involved in paediatric assessment and care

Course Outcomes

CO1	Student should be able to identify, investigate the age related changes in the eyes
CO2	Student should be able to counsel the elderly and able to dispense spectacles with proper instruction
CO3	student should be knowledgeable on common ocular disease
CO4	Have the ability to take a thorough paediatric history which encompasses the relevant developmental, visual, medical and educational issues
CO5	Be familiar with the aetiology, clinical presentation and treatment of amblyopia, comitant strabismus and commonly presenting incomitant strabismus

TEXT BOOKS:

A.J. ROSSENBLOOM Jr & M.W.MORGAN: Vision and Aging, Butterworth- Heinemann, Missouri, 2007.

2. Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
3. Paediatric Optometry –William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

REFERENCE BOOKS:

1. OP Sharma: Geriatric Care –A textbook of geriatrics and Gerontology, viva books, New Delhi, 2005
2. VS Natarajan: An update on Geriatrics, Sakthi Pathipagam, Chennai, 1998
3. DE Rosenblatt, VS Natarajan: Primer on geriatric Care A clinical approach to the older patient, Printers Castle, Cochin, 2002
4. Binocular Vision and Ocular Motility - VON NOORDEN G K Burian Von Noorden's, 2nd Ed., C.V. Mosby Co. St. Louis, 1980.
5. Assessing Children's Vision. By Susan J Leat, Rosalyn H Shute, Carol A Westall. 45 Oxford: Butterworth-Heinemann, 1999.
6. Clinical pediatric optometry. LJ Press, BD Moore, Butterworth- Heinemann, 1993

Unit-1 Introduction	6 hours
1. Structural , and morphological changes of eye in elderly 2. Physiological changes in eye in the course of aging. 3. Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebro-vascular disease, Diabetes, COPD) 4. Optometric Examination of the Older Adult 5. Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye	
Unit-2	8 hours
6. Contact lenses in elderly 7. Pharmacological aspects of aging 8. Low vision causes, management and rehabilitation in geriatrics. 9. Spectacle dispensing in elderly – Considerations of spectacle lenses and frames	
Unit-3	8
hours	
1. The Development of Eye and Vision 2. History taking Paediatric subjects 3. Assessment of visual acuity 4. Normal appearance, pathology and structural anomalies of 4.1 Orbit, Eye lids, Lacrimal system,	

4.2 Conjunctiva, Cornea, Sclera Anterior chamber, Uveal tract, Pupil 4.3 Lens, vitreous, Fundus Oculomotor system 5. Refractive Examination	
Unit-4 hours	9
6. Determining binocular status 7. Determining sensory motor adaptability 8. Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia 9. Remedial and Compensatory treatment of Strabismus and Nystagmus 10. Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics	
Unit-5 hours	8
11. Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism 12. Spectacle dispensing for children 13. Paediatric contact lenses 14. Low vision assessment in children	
Unit-6 15. Mechanical injuries 16. Chemical injuries 17. Thermal injuries 18. Electrical injuries 19. Radiational injuries	

COURSE PLAN (Total: 20 hours) Geriatric Optometry

1. Structural , and morphological changes of eye inelderly
2. Physiological changes in eye in the course ofaging.
3. Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes,COPD)
4. Optometric Examination of the OlderAdult
5. Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of theeye
6. Contact lenses inelderly
7. Pharmacological aspects ofaging
8. Low vision causes, management and rehabilitation ingeriatrics.
9. Spectacle dispensing in elderly – Considerations of spectacle lenses andframes

COURSE PLAN (Total: 25 hours)

1. The Development of Eye and Vision
2. History taking Paediatric subjects
3. Assessment of visual acuity
4. Normal appearance, pathology and structural anomalies of
 - 4.1 Orbit, Eye lids, Lacrimal system,
 - 4.2 Conjunctiva, Cornea, Sclera Anterior chamber, Uveal tract, Pupil
 - 4.3 Lens, vitreous, Fundus Oculomotor system
5. Refractive Examination
6. Determining binocular status
7. Determining sensory motor adaptability
8. Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia
9. Remedial and Compensatory treatment of Strabismus and Nystagmus
10. Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics
11. Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism
12. Spectacle dispensing for children
13. Paediatric contact lenses
14. Low vision assessment in children

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	BINOCULAR VISION -I			
Course Code	BOPT5004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES: On successful completion of this module, a student will be expected to be able to:-

1. Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extraocular muscles.
2. Provide a detailed explanation of, and differentiate between the etiology, investigation and management of binocular vision anomalies.
3. Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

Course Outcomes

CO1	will be able demonstrate an in-depth knowledge of the gross anatomy relating the extraocular muscles.
CO2	will be able demonstrate an in-depth knowledge of the gross physiology relating the extraocular muscles.
CO3	will be able demonstrate and Provide a detailed explanation of, and differentiate between the etiology and investigation of binocular vision anomalies.
CO4	will be able demonstrate provide a detailed explanation of the management of binocular vision anomalies.
CO5	will be able demonstrate and adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

TEXT BOOKS:

1. Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
2. Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
3. Gunter K. V. Mosby Company
4. Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincott Williams & Wilkins publishers

Reference Book (s)

Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

<p>Unit-1 Introduction 6 hours</p>	
<p>1. Binocular Vision and Space perception. 1.1 Relative subjective visual direction. 1.2 Retino motor value 1.3 Grades of BSV 1.4 SMP and Cyclopean Eye 1.5 Correspondence, 1.6 Fusion, Diplopia, Retinal rivalry 1.7 Horopter 1.8 Physiological Diplopia and Suppression 1.9 Stereopsis, Panum’s area, BSV. 1.10 Stereopsis and monocular clues - significance. 1.11 Egocentric location, clinical applications. 1.12 Theories of Binocular vision. 2. Anatomy of Extra Ocular Muscles. 2.1 Rectii and Obliques, LPS. 2.2 Innervation & Blood Supply.</p>	
<p>Unit-2 hours</p>	8
<p>3. Physiology of Ocular movements. 3.1 Center of rotation, Axes of Fick. 3.2 Action of individual muscle. 4. Laws of ocular motility 4.1 Donder’s and Listing’s law 4.2 Sherrington’s law 4.3 Hering’s law 5. Uniocular & Binocular movements - fixation, saccadic & pursuits. 5.1 Version & Vergence. 5.2 Fixation & field of fixation</p>	
<p>Unit-3 hours</p>	8
<p>6. Near Vision Complex Accommodation 6.1 Definition and mechanism (process). 6.2 Methods of measurement.</p>	

6.3 Stimulus and innervation.
6.4 Types of accommodation.
6.5 Anomalies of accommodation – aetiology and management.
7. Convergence
7.1 Definition and mechanism.
7.2 Methods of measurement.
7.3 Types and components of convergence - Tonic, accommodative, fusional, proximal.
7.4 Anomalies of Convergence – aetiology and management.

Unit-4

9hours

8. Sensory adaptations
8.1 Confusion
9. Suppression
9.1 Investigations
9.2 Management
9.3 Blind spot syndrome
10. Abnormal Retinal Correspondence
10.1 Investigation and management
10.2 Blind spot syndrome

Unit-5

hours

8

11. Eccentric Fixation
11.1 Investigation and management
12. Amblyopia
12.1 Classification
12.2 Aetiology
12.3 Investigation
12.4 Management

Unit-6

13.1 Recent advances in Binocular Vision
13.2 Vision therapy and the recent trend
13.3 Neuro-optometry, a glimpse

8 hours

COURSE PLAN (Total: 30 hours)

1. Binocular Vision and Space perception.
 - 1.1 Relative subjective visual direction.
 - 1.2 Retino motor value
 - 1.3 Grades of BSV
 - 1.4 SMP and Cyclopean Eye
 - 1.5 Correspondence,
 - 1.6 Fusion, Diplopia, Retinal rivalry
 - 1.7 Horopter
 - 1.8 Physiological Diplopia and Suppression
 - 1.9 Stereopsis, Panum's area, BSV.
 - 1.10 Stereopsis and monocular clues - significance.
 - 1.11 Egocentric location, clinical applications.
 - 1.12 Theories of Binocular vision.
2. Anatomy of Extra Ocular Muscles.
 - 2.1 Recti and Obliques, LPS.
 - 2.2 Innervation & Blood Supply.
3. Physiology of Ocular movements.
 - 3.1 Center of rotation, Axes of Fick.
 - 3.2 Action of individual muscle.
4. Laws of ocular motility
 - 4.1 Donders' and Listing's law
 - 4.2 Sherrington's law
 - 4.3 Hering's law
5. Uniocular & Binocular movements - fixation, saccadic & pursuits.
 - 5.1 Version & Vergence.
 - 5.2 Fixation & field of fixation
6. Near Vision Complex Accommodation
 - 6.1 Definition and mechanism (process).
 - 6.2 Methods of measurement.
 - 6.3 Stimulus and innervation.
 - 6.4 Types of accommodation.
 - 6.5 Anomalies of accommodation – aetiology and management.
7. Convergence
 - 7.1 Definition and mechanism.
 - 7.2 Methods of measurement.
 - 7.3 Types and components of convergence - Tonic, accommodative, fusional, proximal.
 - 7.4 Anomalies of Convergence – aetiology and management.

- 8. Sensory adaptations
 - 8.1 Confusion
- 9. Suppression
 - 9.1 Investigations
 - 9.2 Management
 - 9.3 Blind spots syndrome
- 10. Abnormal Retinal Correspondence
 - 10.1 Investigation and management
 - 10.2 Blind spots syndrome
- 11. Eccentric Fixation
 - 11.1 Investigation and management
- 12. Amblyopia
 - 12.1 Classification
 - 12.2 Aetiology
 - 12.3 Investigation
 - 12.4 Management

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	SYSTEMIC DISEASES			
Course Code	BOPT5005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: At the end of the course, students should get acquainted with the following:

1. Common Systemic conditions: Definition, diagnostic approach, complications and management options
2. Ocular findings of the systemic conditions
3. First Aid knowledge

Course Outcomes

CO1	Students should be able to understand the common systemic conditions
CO2	Students should be knowledgeable about the definitions of systemic diseases
CO3	students should be knowledgeable about diagnostic approach of systemic diseases
CO4	Students should be able to understand complications and managemnt of systemic diseases
CO5	students should ne able to understand ocular findings and systemic conditions of systemic diseases

TEXT BOOKS:

1. C Haslett, E R Chilvers, N A boon, N R Coledge, J A A Hunter: Davidson's Principles and Practice of Medicine, Ed. John Macleod, 19th Ed., ELBS/Churchill Livingstone. (PPM), 2002

Reference Book (s)

1. Basic and clinical Science course: Update on General Medicine, American Academy of Ophthalmology, Section 1, 1999

Unit-1 Introduction	6 hours
Hypertension Definition, classification, Epidemiology, clinical examination, complications, and management. Hypertensive retinopathy Diabetes Mellitus Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications Diabetic Retinopathy Thyroid Disease Physiology, testing for thyroid disease, Hyperthyroidism, Hypothyroidism, Thyroiditis, Thyroid tumors Grave's Ophthalmopathy Acquired Heart Disease Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm Ophthalmic considerations	
Unit-2	8 hours
Cancer : Incidence Etiology Therapy Ophthalmologic considerations Connective Tissue Disease Rheumatic arthritis Systemic lupus erythematosus Scleroderma Polymyositis and dermatomyositis Sjogren syndrome Behcet's syndrome Eye and connective tissue disease Tuberculosis Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye.	
Unit-3	9 hours

Herpes virus (Herpes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus)

Herpes and the eye

Hepatitis (Hepatitis A, B, C)

Acquired Immunodeficiency Syndrome

Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)

Common Tropical Medical Ailments

Malaria

Typhoid

Dengue

Filariases

Onchocerciasis

Cysticercosis

Leprosy

Unit-4

8 hours

Nutritional and Metabolic disorders:

Obesity

Hyperlipidaemias

Kwashiorkor

Vitamin A Deficiency

Vitamin D Deficiency

Vitamin E Deficiency

Vitamin K Deficiency

Vitamin B1,B2, Deficiency

Vitamin C Deficiency

Myasthenia Gravis

First Aid

General Medical Emergencies

Preoperative precautions in ocular surgeries

Unit-5

9 hours

Psychiatry

Basic knowledge of psychiatric condition and Patient Management

Genetics

Introduction to genetics

Organisation of the cell

Chromosome structure and cell division

Gene structure and basic principles of Genetics.

Genetic disorders and their diagnosis.

Genes and the eye

Genetic counseling and genetic engineering.

Unit-6

8 hours

Advancements in Systemic Diseases

Advances in Drug Delivery Systems for Treating Ocular Complications of Systemic Diseases

Advances in systemic lupus erythematosus

ECHOCARDIOGRAPHY IN SYSTEMIC DISEASE

COURSE PLAN (Total:45 hours)

1. Hypertension
 - 11 Definition, classification, Epidemiology, clinical examination, complications, and management.
 - 12 Hypertensive retinopathy
2. Diabetes Mellitus
 - 21 Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications
 - 22 Diabetic Retinopathy
3. Thyroid Disease
 - 31 Physiology, testing for thyroid disease, Hyperthyroidism, Hypothyroidism, Thyroiditis, Thyroid tumors
 - 32 Grave's Ophthalmopathy
4. Acquired Heart Disease
 - 41 Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm
 - 42 Ophthalmic considerations
5. Cancer :
 - 51 Incidence
 - 52 Etiology
 - 53 Therapy
 - 54 Ophthalmologic considerations
6. Connective Tissue Disease
 - 61 Rheumatic arthritis
 - 62 Systemic lupus erythematosus
 - 63 Scleroderma
 - 64 Polymyositis and dermatomyositis
 - 65 Sjogren syndrome
 - 66 Behcet's syndrome
 - 67 Eye and connective tissue disease
7. Tuberculosis
 - 71 Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye.
8. Herpes virus (Herpes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus)
 - 81 Herpes and the eye
9. Hepatitis (Hepatitis A, B, C)
10. Acquired Immunodeficiency Syndrome

11. Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)
12. Common Tropical Medical Ailments
 - 121 Malaria
 - 122 Typhoid
 - 123 Dengue
 - 124 Filariases
 - 125 Onchocerciasis
 - 126 Cysticercosis
 - 127 Leprosy
13. Nutritional and Metabolic disorders:
 - 131 Obesity
 - 132 Hyperlipidaemias
 - 133 Kwashiorkor
 - 134 Vitamin A Deficiency
 - 135 Vitamin D Deficiency
 - 136 Vitamin E Deficiency
 - 137 Vitamin K Deficiency
 - 138 Vitamin B1,B2, Deficiency
 - 139 Vitamin C Deficiency
14. Myasthenia Gravis
15. First Aid
 - General Medical Emergencies
 - Preoperative precautions in ocular surgeries
16. Psychiatry
 - 161 Basic knowledge of psychiatric condition and Patient Management
17. Genetics
 - 171 Introduction to genetics
 - 172 Organisation of the cell
 - 173 Chromosome structure and cell division
 - 174 Gene structure and basic principles of Genetics.
 - 175 Genetic disorders and their diagnosis.
 - 176 Genes and the eye
 - 177 Genetic counseling and genetic engineering.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	RESEARCH METHODOLOGY AND BIOSTATISTICS			
Course Code	BOPT5006			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives:The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings

Course Outcomes

CO1	Students should be able understand the research designs
CO2	students should be able to do the literature review for the hypothesis generation
CO3	students should acquire a knowledge on statistical analysis
CO4	students should able to understand the methods to prove the hypothesis
CO5	students should able to understand sample size determination

Text Book (s)

Mausner& Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co.

Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.

Reference Book (s)

Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

Unit-1 Introduction	6 hours
Research Methodology	
Introduction to research methods	
Identifying research problem	

Ethical issues in research	
Research design	
Unit-2	8 hours
Types of Data Research tools and Data collection methods Sampling methods Developing a research proposal	
Unit-3	9 hours
Biostatistics Basics of Biostatistics Introduction of Biostatistics Measures of Morality Sampling Statistical significance Correlation	
Unit-4	8 hours
Sample size determination. Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion. Theoretical distributions. Binomial Normal Sampling –necessity of methods and techniques. Chi. Square test (2 x 2)	
Unit-5	9 hours
Hospital Statistics Use of computerized software for statistics	
Unit-6 Research Report Writing: Types of research reports – Brief reports and Detailed reports; Report writing: Structure of the research report- Preliminary section, Main report, Interpretations of Results and Suggested Recommendations; Report writing: Formulation rules for writing the report: Guidelines for presenting tabular data, Guidelines for visual Representations.	

COURSE PLAN (Total: 30 hours) Research

Methodology

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Types of Data
6. Research tools and Data collection methods
7. Sampling methods
8. Developing a research proposal

Biostatistics

1. Basics of Biostatistics
 - 1.1 Introduction of Biostatistics
 - 1.2 Measures of Morality
 - 1.3 Sampling
 - 1.4 Statistical significance
 - 1.5 Correlation
 - 1.6 Sample size determination.
 - 1.7 Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion.
 - 1.8 Theoretical distributions.
 - 1.8.1 Binomial
 - 1.8.2 Normal
 - 1.8.3 Sampling –necessity of methods and techniques.
 - 1.8.4 Chi. Square test (2 x2)
2. Hospital Statistics
3. Use of computerized software for statistics

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

BOVT5008	Vision Technician-I	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This program is aimed at training candidates for the job of a “Vision Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

- Demonstrate knowledge and understanding about the role of Vision technician in the healthcare settings.
- Demonstrate the ability to perform clinical skills essential in performing administrative and certain clinical duties i.e. scheduling appointments, maintaining medical records, recording vital signs and medical histories, preparing patients for examination, and dispensing ophthalmic prescription.
- Demonstrate safe handling of devices and positioning of patient for measurement of visual acuity.
- Demonstrate ability to guide & educate patient on relevant information under the guidance or supervision of ophthalmologist.
- Demonstrate bio medical waste management.
- Practice infection control measures.
- Demonstrate safe practices to use equipment's required in their role.
- Demonstrate safe handling and storing of documents, record maintenance etc.
- Demonstrate techniques to maintain the personal hygiene needs
- Demonstrate professional behavior, personal qualities and characteristics of a Vision Technician
- Demonstrate good communication and team worker ability in the role of Vision Technician

Course Outcomes:

On completion of this course, the students will be able to

CO 1	• Demonstrate knowledge and understanding about the role of Vision technician in the healthcare settings.
CO 2	• Demonstrate the ability to perform clinical skills essential in performing administrative and certain clinical duties i.e. scheduling appointments, maintaining medical records, recording vital signs and medical histories, preparing patients for examination, and dispensing ophthalmic prescription.
CO 3	• Demonstrate safe handling of devices and positioning of patient for measurement of visual acuity.
CO 4	• Demonstrate ability to guide & educate patient on relevant information under the guidance or supervision of ophthalmologist.

CO 5	• Demonstrate knowledge and understanding about the role of Vision technician in the healthcare settings.
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Reference Books

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
2. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
3. Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002
4. M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002
5. HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.
6. H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2nd edition, Butterworth, UK, 1982.
7. WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006
8. T Grosvenor: Primary Care Optometry, 4th edition, Butterworth –heinemann, USA, 2002
9. David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991
10. A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

COURSE CONTENT

Module I

Introduction:

To Healthcare Systems & Ophthalmology Services: Basic Understanding of Healthcare Service Providers (primary, secondary & tertiary) Hospital Functions , Ophthalmology Department & it's facilities & services to patients

Role Of Vision Technician:

- To develop broad understanding of the functions to be performed **by Vision Technician**
- Develop understanding to perform test for visual acuity, patient position and rightly assessing refractive status
- To determine the patient's visual needs
- To maintain, manage, calibration of instruments used in ophthalmology department or eye care facility
- To assist the physician/Ophthalmologist **during eye examination** and procedure/ treatment
- To Identify any cultural and special needs that may influence performance of test
- To develop Understanding of Patient

Comfort and Safety

- To exhibit ethical behavior and understanding of administrative functions

Ocular Anatomy & Physiology:

Understanding different parts of eye and their functions

- To develop an understanding regarding physiology of the eye, visual system, control of eye movements, streaming of visual information
- To understand the functions of different part of eye

Module 2

Introduction To Ophthalmology Related Medical Terminology:

Understand appropriate use of Ophthalmology related medical terminology in daily activities with colleagues, patients and family

Common Eye Disease:

To gain broad understanding regarding common eye

Personnel Hygiene Of Vision Technician:

To develop understanding of the concept of Healthy Living

- To develop understanding & procedures of Hand Hygiene
- To develop techniques of Grooming
- To be equipped with Techniques of Use of PPE
- To be vaccinated against common infectious diseases of eye diseases

Module 3

Sanitation ,Safety & First Aid:

To develop understanding and precautions to maintain hygiene and safety

- Describe common emergency conditions and what to do in medical emergencies
- Describe basics of first aid
- To be able to identify ophthalmic emergencies
- To be able to clean, disinfect, and sterilize contact lenses.
- To develop understanding and precautions to ensure self-safety

Bio Medical Waste Management:

To gain understanding of importance of proper and safe disposal of bio-medical waste & treatment

To gain understanding of categories of bio-medical waste

- To learn about disposal of bio-medical waste – colour coding, types of containers, transportation of waste,etc.
- To gain broad understanding of standards for biomedical waste disposal
- To gain broad understanding of means of bio-medical waste treatment

Module 4

Soft Skills & Communication– I:

Understand art of effective communication and be able to respond to queries and information needed

- Able to handle effective Communication with Patients & Family
- Able to handle effective Communication with Peers/colleagues using medical terminology in communication
- Able to maintain confidentiality and respecting need for privacy

Measurement of Vitals:

To be able to measure vital parameters like Pulse, BP, Temperature, Respiration, Height and Weight of patient

- To be able to raise alarm in case of deviation of vital parameters from normal diseases

Module 5

History Taking:

To be well acquainted with clinical notes writing , assessment forms and formats as per HCO policies

- To develop broad understanding regarding obtaining and recording the history of patient

Patient Positioning For Procedure:

To develop understanding of providing comfortable position for a patient

- To develop broad understanding of position and alignment of patient at the correct distance from the test chart

Module 6

Recent Advancements in field of Vision Technician

Recent advancements in field of Vision Technician

Recent advancements in diagnostic tools used by Vision Technician

Recent advancements in management of Eye Clinic

Literature review

U tube videos

Presentations

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	Campus to Coporate			
Course Code	BOPT6013			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives:

At the end of the course, student would have gained knowledge on various aspects of private optometric practice from Indian perspective.

This course deal with all aspects of optometry practice management – business, accounting, taxation, professional values, and quality & safety aspects.

Course Outcomes

CO1	student should gain knowledge on various aspects of private optometric practice from indian perspective
CO2	student should aquire knowledge on ethical condiserations to be taken beforing treating the patient
CO3	student should understand the medical laws which are build to safeguard the patient care
CO4	student should able to understand the safety aspects
CO5	students should aquire knowledge on accounting, taxation ,professional values and quality and safety aspects.

Unit-1

Business Management:

Practice establishment and development

Stock control and costing

Staffing and staff relations

Business computerization

Unit-2

Accounting Principles

Sources of finance

Bookkeeping and cash flow Taxation and taxation planning
Unit-3
Professionalism and Values Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality Personal values- ethical or moral values Attitude and behaviour- professional behaviour, treating people equally Code of conduct , professional accountability and responsibility, misconduct Differences between professions and importance of team efforts Cultural issues in the healthcare environment
Unit-4
Few of the important and relevant topics that need to focus on are as follows: Medical ethics - Definition - Goal - Scope b Introduction to Code of conduct Basic principles of medical ethics –Confidentiality Malpractice and negligence - Rational and irrational drug therapy Autonomy and informed consent - Right of patients
Unit-5
Care of the terminally ill- Euthanasia Organ transplantation Medico legal aspects of medical records –Medico legal case and type-Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects. Professional Indemnity insurance policy Development of standardized protocol to avoid near miss or sentinel events . Obtaining an informed consent

	Activities Plan
1	Visit to lens manufacturing unit.
2	Visit to contact lens industry.
3	Visit to hospital to understand about OPD process.
4	Visit to hospital to understand the diagnostic tests
5	Visit to hospital to gain knowledge about specialized care.
6	Visit to corporate stores to gain the knowledge of retail operations.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Universal human values and ethics			
Course Code	UHVE1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they ‘really want to be’ in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes:

On completion of this course, the students will be able to

CO 1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO 2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO 3	Understand the value of harmonious relationship based on trust and respect in their life and profession
CO 4	Understand the role of a human being in ensuring harmony in society and nature
CO 5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Book (s)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Book (s)

1. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome’s report*, Universe Books.
5. A Nagraj, 1998, *Jeevan Vidya Ek Parichay*, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Publishers.
7. A N Tripathy, 2003, *Human Values*, New Age International Publishers.
8. SubhasPalekar, 2000, *How to practice Natural Farming*, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers*, Oxford University Press
10. M Govindrajan, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management*, Excel Books.
B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

Unit-1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	8 hours
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|--|
| <ol style="list-style-type: none"> 1. Understanding the need, basic guidelines, content and process for Value Education 2. Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority |
|--|

<p>5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario</p> <p>6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels</p>
<p>Unit-2 Understanding Harmony in the Human Being - Harmony in Myself 8 hours</p> <p>1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'</p> <p>2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha</p> <p>3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)</p> <p>4. Understanding the characteristics and activities of 'I' and harmony in 'I'</p> <p>5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of physical needs, meaning of Prosperity in detail</p> <p>6. Programs to ensure Sanyam and Swasthya</p>
<p>Unit-3 Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</p> <p>10 hours</p> <p>1. Understanding harmony in the Family- the basic unit of human interaction</p> <p>2. Understanding values in human-human relationship; meaning of <i>Nyaya</i> and program for its fulfilment to ensure <i>Ubhay-tripti</i>;</p> <p style="padding-left: 40px;">Trust (<i>Vishwas</i>) and Respect (<i>Samman</i>) as the foundational values of relationship</p> <p>3. Understanding the meaning of <i>Vishwas</i>; Difference between intention and competence</p> <p>4. Understanding the meaning of <i>Samman</i>, Difference between respect and differentiation; the other salient values in relationship</p> <p>5. Understanding the harmony in the society (society being an extension of family): <i>Samadhan, Samridhi, Abhay, Sah-astitva</i> as comprehensive Human Goals</p> <p>6. Visualizing a universal harmonious order in society- Undivided Society (<i>AkhandSamaj</i>), Universal Order (<i>SarvabhaumVyawastha</i>)- from family to world family!</p>
<p>Unit-4 Understanding Harmony in the Nature and Existence - Whole existence as Co-existence</p> <p style="text-align: right;">7 hours</p> <p>1. Understanding the harmony in the Nature</p>

2. **Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature**
3. **Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space**
4. **Holistic perception of harmony at all levels of existence**

Unit-5 Implications of the above Holistic Understanding of Harmony on Professional Ethics

7 hours

1. **Natural acceptance of human values**
2. **Definitiveness of Ethical Human Conduct**
3. **Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order**
4. **Competence in Professional Ethics:**
 - a) **Ability to utilize the professional competence for augmenting universal human order,**
 - b) **Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models**
5. **Case studies of typical holistic technologies, management models and production systems**
6. **Strategy for transition from the present state to Universal Human Order:**
 - a) **At the level of individual: as socially and ecologically responsible engineers, technologists and managers**
 - b) **At the level of society: as mutually enriching institutions and organizations**

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	Contact lens – II			
Course Code	BOPT6001			
Prerequisite	Ocular anatomy&physiology, Geometrical and physical optics			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: Upon completion of the course, the student should be able to:

1. Understand the basics of contactlenses
2. List the important properties of contactlenses
3. Finalise the CL design for various kindspatients
4. Recognize various types offitting
5. Explain all the procedures topatient
6. Identify and manage the adverse effects of contactlens

Course Outcomes

CO1	Explain and enlist the important properties of contact lenses
CO2	Explain summerise the contact lens design for various kinds patients
CO3	Explain and recognize various types of fitting
CO4	Explain all the procedures patient
CO5	Explain and identify and manage the adverse effects of contact lens

Text Book (s) :

1. IACLE modules 1 -10
2. CLAO Volumes 1, 2,3
3. Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann,2006
4. Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann,2004
5. E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins,2008

Reference Book (s)

- 1) Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
- 2) Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- 3) E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

Unit-1 6 Hours
1. SCL Materials & Review of manufacturing techniques 2. Comparison of RGP vs. SCL 3. Pre-fitting considerations for SCL
Unit-2 6 Hours
4. Fitting philosophies for SCL 5. Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum 6. Calculation and finalising SCL parameters 6.1 Disposable lenses 6.2 Advantages and availability
Unit-3 6 Hours
7. Soft Toric CL 7.1 Stabilization techniques 7.2 Parameter selection 7.3 Fitting assessment 8. Common Handling Instructions 8.1 Insertion & Removal Techniques 8.2 Do's and Dont's 9. Care and Maintenance of Soft lenses 9.1 Cleaning agents & Importance 9.2 Rinsing agents & Importance 9.3 Disinfecting agents & importance 9.4 Lubricating & Enzymatic cleaners
Unit-4 6 Hours
10. Follow up visit examination 11. Complications of Soft lenses 12. Therapeutic contact lenses 12.1 Indications

12.2 Fitting consideration
Unit-5 6 Hours
13. Specialty fitting 13.1 Aphakia 13.2 Pediatric 13.3 Post refractive surgery
14. Management of Presbyopia with Contact lenses
Unit: 6 6 Hours Recent Advancements in Contact lens Cosmetic contact lenses Prosthetic contact lenses Scleral and semi sclera lenses Market availability of contact lenses

COURSE PLAN: Total : 45 hours

1. SCL Materials & Review of manufacturing techniques
2. Comparison of RGP vs.SCL
3. Pre-fitting considerations forSCL
4. Fitting philosophies forSCL
5. Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat,Optimum
6. Calculation and finalising SCLparameters
 - 6.1 Disposablelenses
 - 6.2 Advantages andavailability

7. Soft ToricCL
 - 7.1 Stabilizationtechniques
 - 7.2 Parametersselection
 - 7.3 Fittingassessment
8. Common Handling Instructions
 - 8.1 Insertion & RemovalTechniques
 - 8.2 Do's andDont's
9. Care and Maintenance of Softlenses
 - 9.1 Cleaning agents &Importance
 - 9.2 Rinsing agents &Importance
 - 9.3 Disinfecting agents &importance
 - 9.4 Lubricating & Enzymaticcleaners
10. Follow up visitexamination
11. Complications of Softlenses
12. Therapeutic contactlenses
 - 12.1 Indications
 - 12.2 Fittingconsideration
13. Specialtyfitting
 - 13.1 Aphakia
 - 13.2 Pediatric
 - 13.3 Post refractivesurgery
14. Management of Presbyopia with Contactlenses

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Binocular vision – II			
Course Code	BOPT6002			
Prerequisite	Ocular anatomy, Ocular physiology, Geometrical and physical optics			
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The objective of this course is to inculcate the student with the knowledge of different types of strabismus its etiology signs and symptoms, necessary investigations and also management. The student on completion of the course should be able to independently investigate and diagnose case of strabismus with comments in respect to retinal correspondence and binocular single vision. The student should be able to perform all the investigations to check retinal correspondence, state of Binocular Single Vision, angle of deviation and special investigations for paralytic strabismus.

Course Outcomes

CO1	will be able demonstrate an in-depth knowledge of the gross anatomy relating the extra ocular muscles.
CO2	Will be able demonstrate an in-depth knowledge of the gross physiology relating the extraocular muscles.
CO3	Will be able demonstrate and Provide a detailed explanation of, and differentiate between the aetiology and investigation of binocular vision anomalies.
CO4	Will be able demonstrate provide a detailed explanation of the management of binocular vision anomalies.
CO5	Will be able demonstrate and adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

TEXT BOOKS:

1. Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modernpublishers.
2. Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell ScienceLtd
3. Gunter K. VonNoorden: BURIAN- VON NOORDEN'S Binocular vision and

ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company

4. Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, LippincotWilliams & Wilkins publishers

Unit-1

6 Hours

- 1. Neuro-muscular anomalies**
 - 1.1 Classification and etiological factors**
- 2. History – recording and significance.**
- 3. Convergent strabismus**
 - 3.1 Accommodative convergent squint**
 - 3.1.1 Classification**
 - 3.1.2 Investigation and Management**
 - 3.2 Non accommodative Convergent squint**
 - 3.1.3 Classification**
 - 3.1.4 Investigation and Management**

Unit-2

6 hours

- 4. Divergent Strabismus**
 - 4.1 Classification**
 - 4.2 A & V phenomenon**
 - 4.3 Investigation and Management**
- 5. Vertical strabismus**
 - 5.1 Classification**
 - 5.2 Investigation and Management**
- 6. Paralytic Strabismus**
 - 6.1 Acquired and Congenital**
 - 6.2 Clinical Characteristics**

Unit-3

6 hours

- 7. Distinction from comitant and restrictive Squint**
- 8. Investigations**
 - 8.1 History and symptoms**

8.2 Head Posture 8.3 Diplopia Charting 8.4 Hess chart 8.5 PBCT 8.6 Nine directions 8.7 Binocular field of vision
Unit-4 6 Hours
9. Amblyopia and Treatment of Amblyopia 10. Nystagmus 11. Non-surgical Management of Squint
Unit-5 6 hours
12. Restrictive Strabismus 12.1 Features 12.2 Musculo-fascial anomalies 12.3 Duane's Retraction syndrome 12.4 Clinical features and management 12.5 Brown's Superior oblique sheath syndrome 12.6 Strabismus fixus 12.7 Congenital muscle fibrosis 13. Surgical management
Unit 6: 6 hours
Recent advancements of Binocular vision New treatments and therapies of binocular vision Journals and article discussion in the domain of Binocular vision

COURSE PLAN: (Total: 45 hours)

1. Neuro-muscular anomalies
 - 1.1 Classification and etiological factors
2. History – recording and significance.
3. Convergent strabismus
 - 3.1 Accommodative convergent squint
 - 3.1.1 Classification
 - 3.1.2 Investigation and Management
 - 3.2 Non accommodative Convergent squint
 - 3.1.3 Classification

- 3.1.4 Investigation and Management
- 4. Divergent Strabismus
 - 4.1 Classification
 - 4.2 A& V phenomenon
 - 4.3 Investigation and Management
- 5. Vertical strabismus
 - 5.1 Classification
 - 5.2 Investigation and Management
- 6. Paralytic Strabismus
 - 6.1 Acquired and Congenital
 - 6.2 Clinical Characteristics
- 7. Distinction from comitant and restrictive Squint
- 8. Investigations
 - 8.1 History and symptoms
 - 8.2 Head Posture
 - 8.3 Diplopia Charting
 - 8.4 Hess chart
 - 8.5 PBCT
 - 8.6 Nine directions
 - 8.7 Binocular field of vision
- 9. Amblyopia and Treatment of Amblyopia
- 10. Nystagmus
- 11. Non-surgical Management of Squint
- 12. Restrictive Strabismus
 - 12.1 Features
 - 12.2 Musculo-fascial anomalies
 - 12.3 Duane's Retraction syndrome
 - 12.4 Clinical features and management
 - 12.5 Brown's Superior oblique sheath syndrome
 - 12.6 Strabismus fixus
 - 12.7 Congenital muscle fibrosis
- 13. Surgical management

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	PUBLIC HEALTH AND COMMUNITY OPTOMETRY			
Course Code	BOPT6003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: At the end of the course students will be be knowledgeable in the following areas:

1. Community based eye care in India.
2. Prevalence of various eye diseases
3. Developing Information Education Communication materials on eye and vision care for the benefit of the public
4. Organize health education programmes in the community
5. Vision screening for various eye diseases in the community and for different age groups.

Course Outcomes

CO1	Student should understand about community based eye care in india
CO2	Student should aquire knowledge on prevelence of various eye diseased
CO3	Students should aware of developing information education communication materials on eye and vision care for the benefit of the public
CO4	Students should able to organize health education programmes in the community
CO5	Students should able to perform vision screening for various eye diseases in the community and for different age groups

Text Book (s) :

1. GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002
2. Newcomb RD, Jolley JL : Public Health and Community Optometry, Charles C Thomas Publisher, Illinois, 1980

Reference Book (s) :

1. K Park: Park's Text Book of Preventive and Social Medicine, 19th edition, Banarsidas Bhanot publishers, Jabalpur, 2007
2. MC Gupta, Mahajan BK, Murthy GVS, 3rd edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002

Unit-1	8 hours
Public Health Optometry: Concepts and implementation, Stages of diseases Dimensions, determinants and indicators of health Levels of disease prevention and levels of health care patterns Epidemiology of blindness – Defining blindness and visual impairment Eye in primary health care	
Unit-2	8
hours	
Contrasting between Clinical and community health programs Community Eye Care Programs Community based rehabilitation programs Nutritional Blindness with reference to Vitamin A deficiency	
Unit-3	8
hours	
Vision 2020: The Right to Sight Screening for eye diseases National and International health agencies, NPCB Role of an optometrist in Public Health	
Unit-4	
8 hours	
Organization and Management of Eye Care Programs – Service Delivery models Health manpower and planning & Health Economics Evaluation and assessment of health programmes	

Unit-5 8 hours
Optometrists role in school eye health programmes Basics of Tele Optometry and its application in Public Health Information, Education and Communication for Eye Care programs
Unit-6 8 hours
Public Health Surveillance Systems Recent Advances in Community Medicine Recent Advancement in Optometry

COURSE PLAN (Total: 30 hours)

1. Public Health Optometry: Concepts and implementation, Stages of diseases
2. Dimensions, determinants and indicators of health
3. Levels of disease prevention and levels of health care patterns
4. Epidemiology of blindness – Defining blindness and visual impairment
5. Eye in primary health care
6. Contrasting between Clinical and community health programs
7. Community Eye Care Programs
8. Community based rehabilitation programs
9. Nutritional Blindness with reference to Vitamin A deficiency
10. Vision 2020: The Right to Sight
11. Screening for eye diseases
12. National and International health agencies, NPCB
13. Role of an optometrist in Public Health
14. Organization and Management of Eye Care Programs – Service Delivery models
15. Health manpower and planning & Health Economics
16. Evaluation and assessment of health programmes
17. Optometrists role in school eye health programmes
18. Basics of Tele Optometry and its application in Public Health
19. Information, Education and Communication for Eye Care programs

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	OCCUPATIONAL OPTOMETRY			
Course Code	BOPT6005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives: At the end of the course the students will be knowledgeable in the following aspects:

1. In visual requirements of jobs;
2. In effects of physical, chemical and other hazards on eye and vision;
3. To identify occupational causes of visual and eye problems;
4. To be able to prescribe suitable corrective lenses and eye protective wear and
5. To set visual requirements, standards for different jobs.

Course Outcomes

CO1	Student should be able to acquire knowledge on effects of physical, chemical and other hazards on eye and vision
CO2	To identify occupational causes of visual and eye problems
CO3	To be able to prescribe suitable corrective lenses and eye protective wear
CO4	To set visual requirements, standards for different jobs
CO5	should be able to acquire knowledge on visual requirements of various professions

Text Book (s) :

1. PP Santanam, R Krishnakumar, Monica R. Dr. Santanam's text book of Occupational optometry. 1st edition, Published by Elite School of optometry, unit of Medical Research Foundation, Chennai, India, 2015
2. R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001
3. Gunter K. V. Mosby Company
4. Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincott Williams & Wilkins publishers

Reference Book (s)

- 4) G W Good: Occupational Vision Manual available in the following website: www.aoa.org
- 5) N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- 6) J Anshel: Visual Ergonomics Handbook, CRC Press, 2005

- 7) G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

Unit-1	8 hours
Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc. 1.1 Acts and Rules - Factories Act, WCA, ESI Act Electromagnetic Radiation and its effects on Eye	
Unit-2	8 hours
Light – Definitions and units, Sources, advantages and disadvantages, standards Color – Definition, Color theory, Color coding, Color defects, Color Vision test	
Unit-3	8 hours
Occupational hazards and preventive/protective methods Task Analysis	
Unit-4	8 hours
Industrial Vision Screening – Modified clinical method and Industrial Vision test Vision Standards – Railways, Roadways, Airlines	
Unit-5	8 hours
Visual Display Units Contact lens and work	
Unit 6- Recent advances	8 hours
Grundy's working distance classification Occupational health examination Surveys in different work set up, industrial vision screening survey	

COURSE PLAN: (Total: 15 hours)

1. Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc.
 - 1.1 Acts and Rules - Factories Act, WCA, ESI Act.
2. Electromagnetic Radiation and its effects on Eye
3. Light – Definitions and units, Sources, advantages and disadvantages, standards
4. Color – Definition, Color theory, Color coding, Color defects, Color Vision tests
5. Occupational hazards and preventive/protective methods
6. Task Analysis
7. Industrial Vision Screening – Modified clinical method and Industrial Vision test
8. Vision Standards – Railways, Roadways, Airlines
9. Visual Display Units
10. Contact lens and work

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	PRACTICE MANAGEMENT			
Course Code	BOPT6011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives:

At the end of the course, student would have gained knowledge on various aspects of private optometric practice from Indian perspective.

This course deal with all aspects of optometry practice management – business, accounting, taxation, professional values, and quality & safety aspects.

Course Outcomes

CO1	student should gain knowledge on various aspects of private optometric practice from indian perspective
CO2	student should aquire knowledge on ethical condiserations to be taken beforing treating the patient
CO3	student should understand the medical laws which are build to safeguard the patient care
CO4	student should able to understand the safety aspects
CO5	students should aquire knowledge on accounting, taxation ,professional values and quality and safety aspects.

Unit-1**Business Management:**

Practice establishment and development
Stock control and costing
Staffing and staff relations
Business computerization

Unit-2

Accounting Principles**Sources of finance****Bookkeeping and cash flow****Taxation and taxation planning****Unit-3****Professionalism and Values****Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality****Personal values- ethical or moral values****Attitude and behaviour- professional behaviour, treating people equally****Code of conduct , professional accountability and responsibility, misconduct****Differences between professions and importance of team efforts****Cultural issues in the healthcare environment****Unit-4****Few of the important and relevant topics that need to focus on are as follows:****Medical ethics - Definition - Goal - Scope b****Introduction to Code of conduct****Basic principles of medical ethics –Confidentiality****Malpractice and negligence - Rational and irrational drug therapy****Autonomy and informed consent - Right of patients****Unit-5****Care of the terminally ill- Euthanasia****Organ transplantation****Medico legal aspects of medical records –Medico legal case and type-****Records and document related to MLC - ownership of medical records -****Confidentiality Privilege communication - Release of medical information -****Unauthorized disclosure - retention of medical records - other various aspects.****Professional Indemnity insurance policy****Development of standardized protocol to avoid near miss or sentinel events**

. Obtaining an informed consent

Unit VI Human Resources

Team building

Recruiting

Compensation

Review

COURSE PLAN (Total: 15 hours)

1. Business Management:
 - 1.1 Practice establishment and development
 - 1.2 Stock control and costing
 - 1.3 Staffing and staff relations
 - 1.4 Business computerization
2. Accounting Principles
 - 2.1 Sources of finance
 - 2.2 Bookkeeping and cashflow
3. Taxation and taxation planning
4. Professionalism and Values
 - 4.1 Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
 - 4.2 Personal values- ethical or moral values
 - 4.3 Attitude and behaviour- professional behaviour, treating people equally
 - 4.4 Code of conduct , professional accountability and responsibility, misconduct
 - 4.5 Differences between professions and importance of team efforts
 - 4.6 Cultural issues in the healthcare environment

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	MEDICAL LAW AND ETHICS			
Course Code	BOPT6012			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives:

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

Course Outcomes

CO1	student should gain knowledge on various aspects of private optometric practice from indian perspective
CO2	student should aquire knowledge on ethical condiserations to be taken beforing treating the patient
CO3	student should understand the medical laws which are build to safeguard the patient care
CO4	student should able to understand the safety aspects
CO5	students should aquire knowledge on accounting, taxation ,professional values and quality and safety aspects.

Unit-1
Business Management: Practice establishment and development

Stock control and costing Staffing and staff relations Business computerization
Unit-2
Accounting Principles Sources of finance Bookkeeping and cash flow Taxation and taxation planning
Unit-3
Professionalism and Values Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality Personal values- ethical or moral values Attitude and behaviour- professional behaviour, treating people equally Code of conduct , professional accountability and responsibility, misconduct Differences between professions and importance of team efforts Cultural issues in the healthcare environment
Unit-4
Few of the important and relevant topics that need to focus on are as follows: Medical ethics - Definition - Goal - Scope b Introduction to Code of conduct Basic principles of medical ethics –Confidentiality Malpractice and negligence - Rational and irrational drug therapy Autonomy and informed consent - Right of patients
Unit-5
Care of the terminally ill- Euthanasia Organ transplantation Medico legal aspects of medical records –Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information -

Unauthorized disclosure - retention of medical records - other various aspects.

Professional Indemnity insurance policy

Development of standardized protocol to avoid near miss or sentinel events

. Obtaining an informed consent

Unit VI Managing the Practice of Law

Business strategies applied to law firms

Risk Management

Partnership Agreement Due

COURSE PLAN (Total: 15 hours)

Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics–Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill-Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records –Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	VISION TECHNICIAN – II			
Course Code	BOVT6010			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives: This program is aimed at training candidates for the job of a “Vision Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

CO1	Demonstrate knowledge and understanding about the role of Vision technician in the healthcare settings
CO2	Demonstrate the ability to perform clinical skills essential in performing administrative and certain clinical duties i.e. scheduling appointments, maintaining medical records, recording vital signs and medical histories, preparing patients for examination, and dispensing ophthalmic prescription.
CO3	Demonstrate safe handling of devices and positioning of patient for measurement of visual acuity
CO4	Demonstrate ability to guide & educate patient on relevant information under the guidance or supervision of ophthalmologist.
CO5	Demonstrate bio medical waste management.

Text Book (s) :

1. A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
2. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
3. Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002
4. M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002
5. HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.

Reference Book (s)

1. Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
2. Grosvenor: Primary Care Optometry, 4th edition, Butterworth –heinemann, USA, 2002
3. David Henson: Optometric Instrumentations, Butterworth- Heinemann, UK, 1991

Unit-1	8 hours
<p>Basic Optics: To understand the principles, concepts of light and vision • Understanding Eye as refractive apparatus</p> <ul style="list-style-type: none"> • To develop an understanding for prescription of Glasses & lenses <p>Ophthalmic Lens, Refraction Errors & Correction Of Errors: To gain understanding regarding ophthalmic glasses, Astigmatic lenses, Prisms, contact lens, measurement and unit of power etc</p> <ul style="list-style-type: none"> • To understand the principles, concepts, instruments, and methods in optics • Understanding of geometric optics • To develop an understanding of clinical optics <p>Vision Assessment: To know different ways to check visual acuity</p> <ul style="list-style-type: none"> • To be able to conduct torch examination of different parts of eye • To be able to select appropriate visual acuity test and correct illumination in a testing room • Understanding of using Snellen chart according to patient preferences • To be able to use occluder and pinhole • To be able to instill mydriatic or cycloplegic drops or ointments as indicated 	
Unit-2	8 hours
<p>Spectacles ; Preparation & Dispensing: To be able to confirm patient’s existing use of optical correction</p> <ul style="list-style-type: none"> • To develop broad understanding for evaluating optical prescription of spectacles prescribed by specialist • To distinguish between different types of lenses • To be able to identify the optical centre of a lens and lens decentration 	

- To understand regarding principles of focimetry and different types of focimeters
- To obtain various facial frame measurements using standard measuring devices
- To be able to differentiate between frame & lens
- To develop broad understanding for filling laboratory order forms
- To be able to utilize lens focimeters, gauges, and clocks to ascertain power, axis, major (prism) reference positions, center and edge thicknesses, and prism for single-vision and multi-focal lenses

Ophthalmic Equipment:

To understand regarding equipment used in ophthalmology department and their storage process

- To gain understanding regarding cleaning & sterilization of instrument, fumigation, Swab, pads, drums, autoclaving.
- To be able to verbalize the role of VT before any surgical procedure or operation or any procedure
- To be able to understand requirements and protocols for maintenance and calibration of equipment

Unit-3

8 hours

Soft Skills And Communication II:

Learn basic reading and writing skills

- Learn sentence formation • Learn grammar and composition
- Learn how to enhance vocabulary
- Learn Goal setting, team building, team work, time management, thinking and reasoning & communicating with others

Common Ophthalmic Emergencies:

Understand the common ophthalmic emergencies

- To understand what to do in ophthalmic emergencies
- To gain understanding regarding organization's emergency procedures and responsibilities for handling emergencies situations

Sensitization Towards Organization Policies & Procedure:

• Understand the need to follow organization policies and procedures • Understand techniques to remove spills in accordance with policies and procedures of the organization

Unit-4

8 hours

Observing And Reporting:

Understand the importance of observing and reporting before, during & after procedure

- Understanding the importance of timely information to the appropriate authority in case of routine and emergency situations.

Infection Control Measures - Policies and Procedures:

- To understand the importance of hand washing and its steps
- To understand ; Needle Stick Injuries (NSI)
- To gain understanding regarding transmission based precautions and & its types
- To understand the meaning of ventilation and state it's clinical significance
- To understand the principles of linen management
- To understand the process of cleaning, sterilization and disinfection of equipment and work area along with it's significance
- To understand various occupational hazards for a health worker

Confidentiality, Documentation & Records:

- Understand guidelines for documentation
- Learn various types of records of importance for vision technician
- Understand use and importance of records.
- To be able to maintain the confidentiality of the medical records
- Understand abbreviations and symbols
- Enter, transcribe, record, store, or maintain information in written or electronic/magnetic form

Unit-5

8 hours

Professional Behaviour In Healthcare Setting:

- How to maintain restful environment
- Learn general and specific etiquettes to be observed on duty
- Understand need for compliance of organizational hierarchy and reporting
- Understand the legal and ethical issues

- Understand importance of conservation of resources

Basic Computer Knowledge:

- To gain broad understanding about Application of computers in • Practice • Give Introduction to Computers: • Block diagram • Input and Output devices • Storage devices • Give Introduction to operating systems • Need of Operating systems (OS) • Function of OS • Windows 2000 – Utilities and basic operations

Unit-6

8 hours

Recent Advancements in field of Vision Technician:

- Recent Advancements in field of Vision Technician
- Recent Advancements in field of Diagnostics
- Recent Advancements in field of Ocular therapeutics
- Market trends in Field of Vision Technician

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Entrepreneurship Course			
Course Code				
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	1	0	0	1

Course Objectives:

- To introduce development and management of entrepreneurship projects in industries.
- To disseminate knowledge on Business tips.
- To disseminate knowledge on consumer rights, Contract act & Medical negligence.
- To disseminate knowledge on trade practices.
- To aware about current trends in Entrepreneurship.

Course Outcomes:

On completion of course student will be able to:

CO1	The students once they complete their Entrepreneurship projects, shall get an adequate knowledge on industry works.
CO2	Understand business tips.
CO3	Pave the way for the students to understand consumer rights, Contract act & Medical negligence
CO4	Students should be able to gain knowledge on trade practices
CO5	Students should be able to understand the ways to start the entrepreneurship

Text Book (s)

01	Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.
02	Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

Reference Book (s)

01	Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis
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E- Resources

01	Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf
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02	World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
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Websites

01	Cell for IPR Promotion and Management (http://cipam.gov.in/)
02	World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
03	Office of the Controller General of Patents, Designs & Trademarks

Unit-1 Overview of Entrepreneurship	8 Hours
Unit-2 Business entities	8 Hours
Unit-3 Trade practices	8 Hours
Unit-4 Rules & regulations	8 Hours
Unit-5 Current trend	8 Hours
Unit-6 Recent Advancements in Entrepreneurship	8 Hours

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	INTELLECTUAL PROPERTY RIGHTS (IPR)			
Course Code	BOPT5009			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	1	0	0	1

Course Objectives:

- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects
- To aware about current trends in IPR and Govt. steps in fostering IPR

Course Outcomes:

On completion of course student will be able to:

CO1	The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works
CO2	During their research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their idea or innovations
CO3	Pave the way for the students to catch up Intellectual Property(IP) as an career option in research
CO4	Students should be able to gain knowledge on Patenting and trademark registration
CO5	Students should be able to understand the ways to start the entrepreneurship

Text Book (s)

01	Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.
02	Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

Reference Book (s)

01	Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis
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E- Resources

01	Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf
02	World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

Websites

01	Cell for IPR Promotion and Management (http://cipam.gov.in/)
02	World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
03	Office of the Controller General of Patents, Designs & Trademarks

Unit-1 Overview of Intellectual Property

6 hours

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights

Unit-2 Patents

6 hours

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit-3 Copyrights

6 hours

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration

Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

Unit-4 Trademarks

6 hours

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

Unit-5 Other forms of IP

6 hours

Design

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

Geographical Indication (GI)

Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection

Plant Variety Protection

Plant variety protection: meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection

Layout Design Protection

Layout Design protection: meaning – Procedure for registration, effect of registration and term of protection

Unit – 6 Recent advancements in IPR

6 Hours

Recent Patents in IPR

Recent copyrights in IPR

Recent Trademark Registration IPR

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Contact lens Lab-II			
Course Code	BOPT6051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: The subject provides the student with suitable knowledge both in theoretical and practical aspects of Contact Lenses.

Course Outcomes

CO1	student should able to understand the handling of contact lens. They should be able to teach and counsel the patient on maintainance of contact lens
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Text Book (s) :

- 1 IACLE modules 1 – 10
- 2 CLAO Volumes 1, 2, 3
- 3 Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
- 4 Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004

List of Experiments	
1	Experiment to assess the base curve of a contact lens using keratometry
2	Experiment to calculate the total diameter of contact lens using a HVID
3	Experiment to assess the tightness of contact lens using pushpup test
4	Experiment to evaluate the procedure to check the static fitting
5	Experiment to evaluate the procedure to check dynamic fitting
6	Experiment to counsel a neophyte user of contact lens
7	Experiment to counsel on insertion of contact lens
8	Experiement to counsel on removal of contact lens

9	Experiment to evaluate the over refraction of contact lens
10	Experiment to check the followup visit examination of contact lens user

(Total: 30 hours)

1. Examination of old soft Lens
2. RGP Lens fitting
3. RGP Lens Fit Assessment and fluroscein pattern
4. Special RGP fitting (Aphakia, pseudo phakia&Keratoconus)
5. RGP over refraction and Lens flexure
6. Examination of old RGP Lens
7. RGP Lens parameters
8. Fitting Cosmetic Contact Lens
9. Slit lamp examination of Contact Lens wearers
10. Fitting Toric Contact Lens
11. Bandage Contact Lens
12. SPM & Pachymetry at SN During Clinics
13. Specialty Contact Lens fitting (at SN during clinics)

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	BINOCULAR VISION LAB-II			
Course Code	BOPT6052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives: This course deals with understanding of strabismus, its classification, necessary orthoptic investigations, diagnosis and non-surgical management. Along with theoretical knowledge it teaches the clinical aspects and application.

Course Outcomes

CO1	Students should able to adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely
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Text Book (s) :

1. Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
2. Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
3. Gunter K. V. Mosby Company
4. Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincott Williams & Wilkins publishers

List of Experiments	
1	Experiment to understand the hess chart
2	Experiment to perform Diplopia charting
3	Experiment to perform test PBCT
4	Experiment to perform Nine Gaze directions
5	Experiment to perform Worth's 4 dot test
6	Experiment to perform Red filter test
7	Experiment to perform bagolini straiated glasses
8	Experiment to perform 4 prism base out test
9	Experiment to perform TNO random dot test

(Total: 15 hours): Deals with hand-on session the basic binocular vision evaluation techniques.

Total: 45hours

The course is the final series of five directed clinical courses. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. Practical aspects of Binocular vision II, public health & community optometry, and occupational optometry will be covered under the studentship.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Project- Contact lens			
Course Code	BOPT6053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Course Outcomes

CO1	Students will be able to acquire knowledge on Clinical research, advancements in the field of Contact lenses
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Text Book (s) IACLE Module 1-10 CR Kothari,

Research methodology

Reference Book (s) CLAO 1-3 volume

Unit-1 Introduction 8 hours
Introduction to Contact lenses Definition Types of Contact lenses Insertion and removal of Contact lenses
Unit-2 8 hours
Indication and contraindication Parameters Selection of lenses in different conditions
Unit-3 8 hours
What is clinical research Need of research for evidence based practices search engine for literature review
Unit-4 8 hours
Method and methodology for research Inclusion and exclusion criteria to be fixed
Unit-5 8 hours

Hypothesis testing Statistical analysis using softwares Step by step writing guidance	
Unit- VI	8
hours Recent studies on Therapeutic contact lenses, Scleral vs Corneal lenses Studies on Contact lens compliance, complications	

Total: 30 hours

Team of students will be doing a research project under the guidance of a supervisor (who could be optometrists/vision scientists/ ophthalmologist). Student will get the experience of doing a research in systematic approach – identifying the primary question, literature search, identifying the gaps in the literature, identifying the research question, writing up the research proposal, data collection, data analysis, thesis writing and presentation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course	Project- Binocular Vision			
Course Code	BOPT6054			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Course Outcomes

CO1	Students will be able to acquire knowledge on Clinical research, advancements, recent trends, Therapies in the field of Binocular Vision
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Text Book (s) Fiona Rowe, Clinical Orthoptics CR Kothari, Research methodology

Reference Book (s)

CLAO 1-3 volume

Unit-1 Introduction	8 hours
List of all the BV instruments Principle of the instruments The basic optometric set up for Vision therapies	
Unit-2	8 hours
The comparison between different modes of therapies Amblyopia, Suppression Synoptophore, VTS	
Unit-3	8 hours
The need of clinical research Sensitivity and specificity of outcome Finding out the problem statement	
Unit-4	8 hours
Formulating hypothesis Methodology to be adopted and the set up required	
Unit-5	8 hours
Statistical analysis Discussion on the basis of literature review	

**Abstract and conclusion,
publication**

**Unit VI- Recent Advances 8
hours**

**Studies on different vision
therapy
Pleoptic treatment
Recent advancement in
Orthoptics**

Total: 30 hours

Team of students will be doing a research project under the guidance of a supervisor (who could be optometrists/vision scientists/ ophthalmologist). Student will get the experience of doing a research in systematic approach – identifying the primary question, literature search, identifying the gaps in the literature, identifying the research question, writing up the research proposal, data collection, data analysis, thesis writing and presentation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course	Project- Optometric Instruments			
Course Code	BOPT6055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

Course Outcomes

CO1	Students will be able to acquire knowledge on Clinical research, advancements in the field of Optometric Instruments
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Text Book (s) IACLE Module 1-10 CR Kothari,
 Research methodology
 Reference Book (s) CLAO 1-3 volume

Unit-1 Introduction	8 hours
List of all the instruments Principle of the instruments The basic optometric set up	
Unit-2	8 hours
The comparison between devices with similar functions Inter-instrument variability The diagnostic devices in Optometry	
Unit-3	8 hours
The need of clinical research Sensitivity and specificity of a device in measurement Finding out the problem statement	
Unit-4	8 hours
Formulating hypothesis Methodology to be adopted and the set up required	
Unit-5	8 hours
Statistical analysis Discussion on the basis of literature review	

**Abstract and conclusion,
publication**

Unit- 6

8 hours

**New generation devices
Comparative studies on functionality
Reviews on the normative data of ocular
parameters by different devices**

Total: 30 hours

Team of students will be doing a research project under the guidance of a supervisor (who could be optometrists/vision scientists/ ophthalmologist). Student will get the experience of doing a research in systematic approach – identifying the primary question, literature search, identifying the gaps in the literature, identifying the research question, writing up the research proposal, data collection, data analysis, thesis writing and presentation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course	Clinical Optometry-V(VT Lab-II)			
Course Code	BOVT6056			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

This program is aimed at training candidates for the job of a “Vision Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

CO1	Demonstrate the ability to perform clinical skills essential in performing administrative and certain clinical duties i.e. scheduling appointments, maintaining medical records, recording vital signs and medical histories, preparing patients for examination, and dispensing ophthalmic prescription.
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Text Book (s) :

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
2. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
3. Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002
4. M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002

List of Experiments	
1	Describe different manpower in ophthalmic team & their role.
2	Duties & responsibilities of vision technician .
3	Prepare a plan for examination a)examination format b)illumination c)sop d)distance

	e)calibration
4	Prepare a plan of history taking for eye OPD.
5	Use your clinical skill to assess various types of refractive error.
6	Describe objective and subjective refraction.
7	Preparing a patient record and prescripion format.
8	Preparing a patient instruction format.
9	How to assess patient for visual field.
10	How to assist an ophthalmologist in operation theater.
11	Describe the factor that cause hospital acquired infection importance of hand wash.
12	Describe vital parameters and how to control abnormalities.
13	Describe & enlist personal protective equipment & their use.
14	Explain professional behavior & describe optometry oaths.
15	Experiment on recent advancements in field of Vision Technician.

Total: 45hours

The course is the final series of five directed clinical courses. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. Practical aspects of Binocular vision II, public health & community optometry, and occupational optometry will be covered under the studentship.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	CLINICAL OPTOMETRY V (STUDENTSHIP)			
Course Code	BOPT6057			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objective:

The objective of the course is to:

This course covers various clinical optometry procedures involving external examination, anterior segment and posterior segment examination, neuroophthalmic examination, paediatric optometry examination, and Glaucoma evaluation.

Course Outcomes

At the end of the course, students will be able to:

CO1	Students should be able to understand the purpose of setup and requirements
CO2	students should be able to understand the devices and the method of handling
CO3	students should be able to understand the indications and contraindications of the test
CO4	studetns should able to coorelate the step by step procedure and way of documentation of the findings
CO5	students should able to coorealte the interpretation of the findings od the various clinical optometry procedures

Text Books

- 1 Clinical Ophthalmology a systamatic approach by Jack J kanski 8th edition
- 2 A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Reference Books

- 3 **Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990**
- 4 **D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007**

5 J .B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry,
Lippincott Williams and Wilkins,1991

Course Content

Unit I Introduction 8 hours History taking Visual acuity estimation Extraocular motility, Cover test, Alternating cover test Hirschberg test, Modified Krimsky Pupils Examination	
Unit II: Various test Maddox Rod Van Herrick External examination of the eye, Lid Eversion Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),	8 hours
Unit III: Binocular function test 8 hours Color Vision Stereopsis Confrontation test Photostress test	
Unit IV : Eye examinations 8 hours Slit lamp biomicroscopy Ophthalmoscopy Tonometry ROPLAS	
Unit V: Miscellaneous test hours Amsler test Contrast sensitivity function test Saccades and pursuit test	8
Unit VI: Recent advancements in field of Clinical Optometry Recent Diagnostics Understanding of results of Optometric Examination	8 hours

MoHFW recommended: Total: 15 hours

Students will observe the basic operations of the optometry clinic while interacting with the multidisciplinary team members involved in providing optimal care to patients. The student will be introduced to optical terminology, equipment, and techniques used for treatment.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course	CLINICAL INTERNSHIP-I			
Course Code	BOPT7001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	2	0	0	2

Course Objectives:

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

During these semesters students also will continue the research work allotted during the sixth semester and submit the final report and make presentation in front of the experts.

Internships postings can be in the following locations: Eye Hospitals, Eye clinics in general hospital, Independent eye clinics, Optometric clinics in eye hospitals, general hospitals or optical showrooms, optical showrooms and other relevant locations wherein the learning objective can be achieved. Short period of training to eye care (instruments, optical, contact lens) related manufacturing set- ups, corporates and nongovernmental organisations.

Course Outcomes

CO1	To understand about the basic optometric set up in a clinic
CO2	To get acquainted with the procedures carried out in a patient care
CO3	To apply theoretical knowledge in diagnosis and detection of an ocular ailment
CO4	To understand the role of research in inculcating an evidence based practice
CO5	To understand the need of ethical approval prior to starting a research project

Text Book (s)

1. J Boyd Eskridge, John F Amos, ‘ Clinical procedures in Optometry’

Reference Book (s)

2. C R Kothari, 'Research Methodology'

Unit-1	Introduction and Orientation
8 hours	
-	<ol style="list-style-type: none"> 1. An orientation programme to introduce hospital based patient care 2. Vision, mission of the organisation with accreditation body guidelines to be followed(if any)
Unit-2	Clinical procedures in Optometry
8 hours	
	<ol style="list-style-type: none"> 1. Hands on training to be conducted keeping the students on observation prior to handling patients 2. Materials, eyedrops to be required for carrying out tests in a daily basis 3. Proper introduction of waste management system
Unit-3	Clinical Research
8 hours	
	<ol style="list-style-type: none"> 1. Introducing the need of clinical research in carrying out an evidence based patient care 2. Formulating a research proposal 3. Availability of resources to be required for carrying out the experiments
Unit-4	Research Methodology and Ethical approval
8 hours	
	<ol style="list-style-type: none"> 1. Ethical board review of the study proposed 2. Post approval, sampling and collection of data 3. Running statistical analysis to agree or disagree the hypothesis 4. Discussion based on literature
Unit-5	Publication and outcome
8 hours	
	<ol style="list-style-type: none"> 1. Writing the dissertation with all the annexure 2. Writing a scientific paper in a good indexed journal
Unit-6	Recent Advances
8 hours	
	<ol style="list-style-type: none"> 1. The new generation diagnostic device 2. The normative datas of different ocular parameters studies 3. OCT, VEP, AS-OCT, B scan, A-scan

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100
Name of The Course		Research Project-II

Course Code	BOPT7051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	J
	0	0	8	

Course Objectives:

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

During these semesters students also will continue the research work allotted during the sixth semester and submit the final report and make presentation in front of the experts.

Internships postings can be in the following locations: Eye Hospitals, Eye clinics in general hospital, Independent eye clinics, Optometric clinics in eye hospitals, general hospitals or optical showrooms, optical showrooms and other relevant locations wherein the learning objective can be achieved. Short period of training to eye care (instruments, optical, contact lens) related manufacturing set- ups, corporates and nongovernmental organisations.

Course Outcomes

CO1	To understand about the basic optometric set up in a clinic
CO2	To get acquainted with the procedures carried out in a patient care
CO3	To apply theoretical knowledge in diagnosis and detection of an ocular ailment
CO4	To understand the role of research in inculcating an evidence based practice
CO5	To understand the need of ethical approval prior to starting a research project

Text Book (s)

Reference Book (s)

3. J Boyd Eskridge, John F Amos, ' Clinical procedures in Optometry'
4. C R Kothari, 'Research Methodology'

List of experiments-

1. To identify the area of research interest
2. To Formulate the research question
3. To perform literature review using search engines such as pubmed, google scholar
4. To apply for Ethical approval
5. To make a research proposal, hypothesis
6. To specify materials and methodology, inclusion and exclusion criteria for the participants
7. To compute data and explain the results and outcome
8. To discuss the different research studies and conclude the significance

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course	CLINICAL INTERNSHIP INCLUDING RESEARCH PROJECT WORK				
Course Code	BOPT8001				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	J	C
	0	0	0	40	20

Course Objectives:

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

During these semesters students also will continue the research work allotted during the sixth semester and submit the final report and make presentation in front of the experts.

Internships postings can be in the following locations: Eye Hospitals, Eye clinics in general hospital, Independent eye clinics, Optometric clinics in eye hospitals, general hospitals or optical showrooms, optical showrooms and other relevant locations wherein the learning objective can be achieved. Short period of training to eye care (instruments, optical, contact lens) related manufacturing set- ups, corporates and nongovernmental organisations.

Course Outcomes

CO1	To understand about the basic optometric set up in a clinic
CO2	To get acquainted with the procedures carried out in a patient care
CO3	To apply theoretical knowledge in diagnosis and detection of an ocular ailment
CO4	To understand the role of research in inculcating an evidence based practice
CO5	To understand the need of ethical approval prior to starting a research project

Text Book (s)

5. J Boyd Eskridge, John F Amos, ‘ Clinical procedures in Optometry’

Reference Book (s)

6. C R Kothari, ‘Research Methodology’

Unit-1	Introduction and Orientation
8 hours	
-	<ol style="list-style-type: none"> 3. An orientation programme to introduce hospital based patient care 4. Vision, mission of the organisation with accreditation body guidelines to be followed(if any)
Unit-2	Clinical procedures in Optometry
8 hours	
	<ol style="list-style-type: none"> 4. Hands on training to be conducted keeping the students on observation prior to handling patients 5. Materials, eyedrops to be required for carrying out tests in a daily basis 6. Proper introduction of waste management system
Unit-3	Clinical Research
8 hours	
	<ol style="list-style-type: none"> 4. Introducing the need of clinical research in carrying out an evidence based patient care 5. Formulating a research proposal 6. Availability of resources to be required for carrying out the experiments
Unit-4	Research Methodology and Ethical approval
8 hours	
	<ol style="list-style-type: none"> 5. Ethical board review of the study proposed 6. Post approval, sampling and collection of data 7. Running statistical analysis to agree or disagree the hypothesis 8. Discussion based on literature
Unit-5	Publication and outcome
8 hours	
	<ol style="list-style-type: none"> 3. Writing the dissertation with all the annexure 4. Writing a scientific paper in a good indexed journal
Unit- 6	Recent advances
8 hours	
	<ol style="list-style-type: none"> 1. Newer generation devices in ophthalmology 2. Review articles on different clinical research trials 3. Diagnostic devices-Anterior and posterior

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
30	70	100

Name of The Course	Research Project-III			
Course Code	BOPT8051			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	8	4

Course Objectives:

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

During these semesters students also will continue the research work allotted during the sixth semester and submit the final report and make presentation in front of the experts.

Internships postings can be in the following locations: Eye Hospitals, Eye clinics in general hospital, Independent eye clinics, Optometric clinics in eye hospitals, general hospitals or optical showrooms, optical showrooms and other relevant locations wherein the learning objective can be achieved. Short period of training to eye care (instruments, optical, contact lens) related manufacturing set- ups, corporates and nongovernmental organisations.

Course Outcomes

CO1	To understand about the basic optometric set up in a clinic
CO2	To get acquainted with the procedures carried out in a patient care
CO3	To apply theoretical knowledge in diagnosis and detection of an ocular ailment
CO4	To understand the role of research in inculcating an evidence based practice
CO5	To understand the need of ethical approval prior to starting a research project

Text Book (s)

Reference Book (s)

7. J Boyd Eskridge, John F Amos, ' Clinical procedures in Optometry'
8. C R Kothari, 'Research Methodology'

List of experiments-

9. To identify the area of research interest
10. To Formulate the research question
11. To perform literature review using search engines such as pubmed, google scholar
12. To apply for Ethical approval
13. To make a research proposal, hypothesis
14. To specify materials and methodology, inclusion and exclusion criteria for the participants
15. To compute data and explain the results and outcome
16. To discuss the study outcomes and practice evidence based clinical practice

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

Name of The Course				
Course Code				
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C

Course Objectives

- 1.
- 2.
- 3.
- 4.

Course Outcomes

CO1	
CO2	
CO3	
CO4	
CO5	
CO6	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	-	50	100

Course Content:

Unit I: Introduction to Computers and Algorithms xx Hours
Unit II: Constructs of C 8 Hours
Unit III: Arrays Hours

Unit IV: Functions Hours
Unit V: Structures Hours
Unit VI

Suggested Reading

- 1.
- 2.
- 3.
- 4.
- 5.



(Under the Uttar Pradesh Private Universities Act No. 12 of 2019)

**Curriculum and Syllabus
2020-2024**

**School of Medical & Allied Sciences
Program :B.Sc.Medical Lab Technology**



COURSE BOOK - 2020
Volume-

B.Sc.Medical Lab Technology

Vision :

To be known globally in preparing highly competent Medical laboratory scientists through innovation, interdisciplinary research and excel in laboratory medicine field.

Mission:

M1: Establish state of art facilities for advancement and excellence in the field of Medical laboratory Technology education

M2: Collaborate with Medical laboratory professionals to align the curriculum and develop strong foundation .

M3: Make expertise health care professionals with global competency in handling advanced laboratory automation to work effectively in a wide range of laboratory settings.

Program Educational Objectives:

Graduates of Medical Laboratory Technology shall,

PEO-1

Establish/Maintain ethical standards of clinical laboratory as per regulations of accreditation bodies.

PEO-2

Undertake higher studies at any reputed institutions in the field of Medical and Allied sciences.

PEO-3

Evolve the new technologies and engage in entrepreneur activities.

Program Outcomes:

At the time of graduation Students of Medical Laboratory Technology programmeshall able to,

- **PO1. Thinking Abilities**

Develop the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice and verify the accuracy of laboratory results obtained.

- **PO2. Planning Abilities**

Develop effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

- **PO3. Communication**

Develop professional conduct and interpersonal communication skills with patients, laboratory personnel, other health care professionals, and with the public & communicate effectively with society at large

- **PO4. Medical Laboratory Technology Knowledge**

Possess and comprehend the core and basic knowledge associated with the profession of Medical laboratory Technology including basic diagnosis. Provide technical information about test results; Prepare and document medical tests and clinical results.

- **PO5. Medical Laboratory Technology Ethics**

- Honor personal values and apply ethical principles in professional and social contexts. Perform within the guidelines of the code of ethics established by state and local regulatory groups.

- **PO6. Environment and sustainability**

- Understand the impact of the professional medical laboratory technology solutions in environmental contexts and demonstrate the knowledge of and need for sustainable development.

- **PO7. Life-long learning**

- Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change in identify learning needs and to satisfy these needs on an ongoing basis upgrading skills in laboratory Sciences.

- **PO8. Modern tool usage**

- Learn, select, apply & develop appropriate methods and procedures, resources, and modern laboratory-related computing tools with an understanding of the limitations to operate and maintain laboratory equipment

Curriculum

B.Sc.Medical Lab Technology

Semester 1

Sl. No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BMLS1001	Introduction to National Healthcare Delivery System in India	2	-	-	1	50	-	-
2	BMLS1002	Basic computers and information Science	2	-	-	2	5	10	35
3	BLLUCT1001	Professional Communication – BEC 1	0	0	6	3			
4	BMLS1004	Medical Terminology, Record keeping (including anatomical terms) and Orientation to Medical Laboratory Science (MLS)	2	-	-	2	5	10	35
5	BMLS1005	Medical Law and Ethics	2	-	-	2	5	10	35
6	BMLS1006	Introduction to Quality and Patient safety (including Basic emergency care and life support skills, Infection prevention and control, Biomedical waste management, Disaster management and Antibiotic resistance)	3	1	-	2	5	10	35
7	BMLS1007	Professionalism and values	1	-	-	1	50	-	-
8	BMLS1009	Principals of Management with special reference to Medical Laboratory Science (MLS) management	2		-	2	5	10	35
9	BMLS1010	Community orientation and clinical visit	1	-	-	1	50	-	-
10	BMLS1051	Basic computers and information Science – Practical	-	-	4	2	5	10	35
11	BMLS1053	Medical Terminology, Record keeping (including	-	-	2	1	5	10	35

		anatomical terms) and Orientation to Medical Laboratory Science (MLS) – Practical							
12	BMLS1054	Introduction to Quality and Patient safety (including Basic emergency care and life support skills, Infection prevention and control, Biomedical waste management, Disaster management and Antibiotic resistance) – Practical	-	-	4	2	5	10	35
13	BMLS1056	Principals of Management with special reference to Medical Laboratory Science (MLS) management- Practical	-	-	2	1	5	10	35
14	BLEUCT1002	Creative / Liberal Arts	0	0	1	0.5	Workshop Mode (8-10 hrs)	Activity based assessment	
15	BCEUCT1002	Waste Management	1	0	0	1	Workshop Mode (15 hrs)		
		Total	15	1	19	23.5			

Semester II

Sl No	Course Codee	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BMLS2001	General Medical Microbiology	4	-	-	4	10	20	70
2	BMLS2002	Basic Haematology	4	-	-	4	10	20	70
3	BMLS2003	Basic Clinical Biochemistry	4	-	-	4	10	20	70
4	BMLS2004	Human Anatomy and Physiology	4	-	-	4	10	20	70
5	BLLUCT1002	Professional Communication – BEC 2	0	0	6	3			

6	BMLS2051	General Medical Microbiology – (Practical)	-	-	4	2	10	20	70
7	BMLS2052	Basic Haematology – (Practical)	-	-	4	2	10	20	70
8	BMLS2053	Basic Clinical Biochemistry – (Practical)	-	-	2	1	10	20	70
9	BMLS2054	Human Anatomy and Physiology – (Practical)	-	-	4	2	10	20	70
10	BCEUCT1001	Environmental Studies	0	1	0	0.5	Workshop Mode (8-10 hrs)		
		Total	16	1	20	26.5			

Semester III

Sl No	Course Code	Name of the Course	Assessment Pattern						
			L	T	P	C	IA	MTE	ETE
1	BMLS3001	Systematic Bacteriology	4	-	-	4	10	20	70
2	BMLS3002	Basics of Haematological diseases	4	-	-	4	10	20	70
3	BMLS3003	Biochemical metabolism	4	-	-	4	10	20	70
4	BMLS3004	Fundamentals of Histology	3	-	-	3	10	20	70
5	BMLS3005	Blood Banking & Genetics	3	-	-	3	10	20	70
6	BMLS3051	Systematic Bacteriology – (Practical)	-	-	4	2	10	20	70
7	BMLS3052	Basics of Hematological diseases – (Practical)	-	-	4	2	10	20	70
8	BMLS3053	Biochemical metabolism – (Practical)	-	-	4	2	10	20	70
9	BMLS3054	Fundamentals of Histology – (Practical)	-	-	2	1	10	20	70

10	BMLS3055	Blood Banking & Genetics – (Practical)	-	-	2	1	10	20	70
11	BCSUCT1001	AI and its Applications	0	0	4	2	Workshop Mode (30 hrs)		
12	BLEUCT1001	Foreign Language (Compulsory Open Elective)	2	0	0	2			
		Total	20		20	30			

Semester IV

Sl No	Course Code	Name of the Course	Assessment Pattern						
			L	T	P	C	IA	MTE	ETE
1	BMLS4001	Applied Bacteriology	4	-	-	4	10	20	70
2	BMLS4002	Applied Haematology – I	3	-	-	3	10	20	70
3	BMLS4003	Analytical Clinical Biochemistry	3	-	-	3	10	20	70
4	BMLS4004	Applied Histopathology – I	4	-	-	4	10	20	70
5	BMLS4005	Medical Mycology and Virology	4	-	-	4	10	20	70
6	BMLS4051	Applied Bacteriology – (Practical)	-	-	4	2	10	20	70
7	BMLS4052	Applied Haematology - I - (Practical)	-	-	4	2	10	20	70
8	BMLS4053	Analytical Clinical Biochemistry– (Practical)	-	-	4	2	10	20	70
9	BMLS4054	Applied Histopathology - I – (Practical)	-	-	4	2	10	20	70
10	BMLS4055	Medical Mycology and Virology I– (Practical)	-	-	2	1	10	20	70
		Total	18		18	27			

Semester V

Sl No	Course Code	Name of the Course	Assessment Pattern						
			L	T	P	C	IA	MTE	ETE
1	BMLS5001	Immunology & Bacterial serology	4	-	-	4	10	20	70
2	BMLS5002	Applied Haematology – II	3	-	-	3	10	20	70
3	BMLS5003	Applied Clinical Biochemistry – I	3	-	-	3	10	20	70
4	BMLS5004	Applied Histopathology - II	4	-	-	4	10	20	70
5	BMLS5005	Immunopathology & Molecular Biology	4	-	-	4	10	20	70
6	BMLS5051	Immunology & Bacterial serology – (Practical)	-	-	2	1	10	20	70
7	BMLS5052	Applied Haematology - II– (Practical)	-	-	4	2	10	20	70
8	BMLS5053	Applied Clinical Biochemistry – I – (Practical)	-	-	4	2	10	20	70
9	BMLS5054	Applied Histopathology-II– (Practical)	-	-	2	1	10	20	70
10	BMLS5055	Immunopathology & Molecular Biology – (Practical)	-	-	2	1	10	20	70
11	BLLUCT1003	Campus to Corporate	3	0	0	3			
		Total	21		14	28			

Semester VI

Sl No	Course Code	Name of the Course	Assessment Pattern						
			L	T	P	C	IA	MTE	ETE
1	BMLS6001	Medical Parasitology & Entomology	4	-	-	4	10	20	70
2	BMLS6002	Advanced Haematology	3	-	-	3	10	20	70

1	BMLS8001	MLT Internship-II	0	0	720	22		
2	BMLS8002	Project-II	0	0	0	4		
		Total				26		

Detailed Syllabus

Name of The Course	Introduction to National Healthcare Delivery System in India			
Course Code	BMLS1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	1

Course Objectives

1. Apply knowledge on understanding what is health care delivery
2. Identify Health scenario of India, Demography & Vital Statistics
3. Explain National Health Programme- Background objectives, action plan, targets, operations.

Course Outcomes

CO1	Recall various healthcare delivery systems & National Health Programme- Background objectives, action plan, targets, operations,
CO2	Make use of National Health Programme- Background objectives, action plan, targets, operations & AYUSH system of medicine
CO3	Identify Health scenario of India, Demography, Vital Statistics & basics in Epidemiology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50			50

Course Content:

Unit I: Introduction to healthcare delivery system & National Health Programme 6 Hours
Healthcare delivery system in India at primary, secondary and tertiary care, Community participation in healthcare delivery system, Health system in developed countries, Private Sector, National Health Mission, National Health Policy, Issues in Health Care Delivery System in India. National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme.

Unit II: Introduction to AYUSH system of medicine & Health scenario of India 6 Hours
Introduction to Ayurveda, Yoga and Naturopathy, Unani, Siddha, Homeopathy, Need for integration of various system of medicine. Health scenario of India – past, present and future, Public health – India (epidemiology and demography).
Unit III: Demography & Vital Statistics & Epidemiology 6 Hours
Demography & Vital Statistics- Demography – its concept, Vital events of life & its impact on demography, Significance and recording of vital statistics, Census & its impact on health policy. Principles of Epidemiology, Natural History of diseases, Methods of Epidemiological studies, Epidemiology of communicable & non-communicable diseases, disease transmission, host defence immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Suggested Reading

1. Vikas Singh, D J Bhaskar, Chandan Agali R, Mallika Kishore, Safalya S Kadtane, Harender Singh. "Adenomatoid Odontogenic tumour: Report of a Case and Review of Literature". International Journal of Scientific Study. 2014;1(4):63-66.
2. Hand book of Health care quality & patient safety
3. Wilson & Walkar's Principles and techniques of Biochemistry and Molecular Biology by Andreas Hofmann

Name of The Course	Basic Computers And Information Science			
Course Code	BMLS1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. Apply their knowledge on understanding various computing skills
2. Can handle and resolve common problems in hardware
3. Build knowledge on using MS-office

Course Outcomes

CO1	Define Introduction to computers, Input output devices, Processor and memory & storage device
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CO2	Outline the Introduction of windows, MS-Word
CO3	Experiment and function with Excel, Power Point & Operating System, Computer networks, Internet and its Applications & Application of Computers

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:**Unit I: Introduction to computers, Input output devices & Processor and memory & Storage Devices****hours: 6 Hours**

Introduction to computers: Introduction, characteristics of computers, block diagram of computers, generations of computers, computer languages. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems). Processor and memory: Central Processing Unit (CPU), main memory. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit-2: , Introduction of windows & Introduction to MS-Word**6 Hours**

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.) Introduction, components of a word window, creating, opening and

inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3: Introduction to Excel, Introduction to PowerPoint & Introduction of Operating System, Computer networks, Internet and its Applications & Application of Computers

8 Hours

Introduction to Excel: Introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to PowerPoint: Introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: Introduction, operating system concepts, types of operating system. Computer networks: Introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network. Internet and its Applications: Definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in clinical settings

Suggested Reading

1. Information technology by Anshuman Sharma (Lakhanpal Publisher)
2. Computer Fundamentals (Concepts, Systems and applications) by P. K. Sinha (University of Tokyo, Japan) BPB Publications.

Name of The Course	Medical Terminology, Record keeping (including anatomical terms) and Orientation to Medical Laboratory Science (MLS)
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Course Code	BMLS1004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. Recall basic concepts in Medical Lab Science
2. Explain Medical Terminology, Record keeping
3. Explain and give orientation to Medical laboratory sciences

Course Outcomes

CO1	Explain Medical Terminology, Record keeping & basic concepts in Medical Lab Science
CO2	Explain the Common laboratory associated hazards and biosafety measures including radiation hazards
CO3	Develop specific role in different departments of in Medical lab profession

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

<p>Unit-1: Medical Terminology, Record keeping & Orientation to Medical Laboratory Science 12 Hours</p> <p>Derivation of medical terms, Define word roots, prefixes, and suffixes, Conventions for combined morphemes and the formation of plurals, Basic medical terms, Form medical terms utilizing roots, suffixes, prefixes, and combining roots, Interpret basic medical abbreviations/symbols, Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system, Interpret medical orders/reports, Data entry and management on electronic health record system. Medical Lab Science – Introduction, Career opportunities in MLS, Role of a Medical lab. Professional in Health care system.</p>
<p>Unit-2: Laboratory Hazards and Biosafety 4 Hours</p> <p>Laboratory hazards and biosafety in Microbiology, Hematology, Histopathology, Biochemistry laboratories</p>
<p>Unit-3: Introduction and Subject specific role of a various departments in Medical lab 12 Hours</p> <p>Microbiology Role of microbes in human health, Overview of the role of Medical Laboratory Professional in Medical Microbiology, Haematology- Introduction to Haematological diseases, Overview of the role of Medical lab. Professional in Haematology, Histopathology-Introduction to Tumor pathology, Overview of the role of Medical lab. Professional in Histopathology, Biochemistry- Introduction to metabolic disorders, Overview of the role of Medical lab. Professional in Clinical Biochemistry,</p>

Suggested Reading

1. An Introduction to Medical Lab Technology by F J Baker and Silverton
2. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur
3. Medical Laboratory Technology by Mukherjee

Name of The Course	Medical Law and Ethics			
Course Code	BMLS1005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. Apply their knowledge on medical ethics
2. Explain Organ transplantation & Medico legal aspects of medical records

Course Outcomes

CO1	Define Medical ethics, Code of conduct Definition & Basic principles of medical ethics
CO2	Outline what is Malpractice and negligence, Autonomy and informed consent & Care of the terminally ill & insurance policy and develop protocol to avoid near miss or sentinel events.
CO3	Explain Organ transplantation & Medico legal

aspects of medical records & Obtaining an informed consent and ethics of MLT profession

medical records – other various aspects. Ethics in the profession of Medical Laboratory Science

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Suggested Reading

1. Medical Law and Ethics by Jonathan Herring
2. Medical Law and Ethics by Bonnie F Fremgen

Course Content:

<p>Unit-1: Introduction to medical ethics 5 Hours</p> <p>Medical ethics – Definition – Goal – Scope, Introduction to Code of conduct, Basic principles of medical ethics – Confidentiality</p>
<p>Unit-2: Malpractice and negligence, Autonomy and informed consent & Care of the terminally ill- & Professional Indemnity insurance policy 7 Hours</p> <p>Malpractice and negligence – Rational and irrational drug therapy, Autonomy and informed consent – Right of patients, Care of the terminally ill- Euthanasia. Development of standardized protocol to avoid near miss or sentinel events</p>
<p>Unit-3: Organ transplantation & Medico legal aspects of medical records & Obtaining an informed consent 10 Hours</p> <p>Organ transplantation, Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC – ownership of medical records – Confidentiality Privilege communication – Release of medical information – Unauthorized disclosure – retention of</p>

Name of The Course	Introduction to Quality and Patient safety (including Basic emergency care and life support skills, Infection prevention and control Biomedical waste management, Disaster management and Antibiotic resistance).			
Course Code	BMLS1006			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	1	0	2

Course Objectives

1. Summarize Bio medical waste management and environment safety

Course Outcomes

CO1	Define Quality assurance and Basics of emergency care
CO2	Summarize Bio medical waste management and Infection prevention
CO3	Summarize Antibiotic Resistance and Disaster preparedness

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

<p>Unit-1: Quality assurance and Basics of emergency care 14 Hours</p> <p>Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools & Introduction to NABH guidelines Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR, Using an AED (Automated external defibrillator) & Managing an emergency including moving a patient.</p>
<p>Unit-2: Bio medical waste management and Infection prevention 14 Hours</p>

Modern Technology for handling BMW, Use of Personal protective equipment (PPE) & Monitoring & controlling of cross infection (Protective devices) Prevention & control of common healthcare associated infections, Components of an effective infection control program, and Guidelines (NABH and JCI) for Hospital Infection Control. Antibiotic Resistance- History of antibiotics How resistance happens and spreads, Types of resistance- intrinsic, acquired, passive, Trends in drug resistance & Actions to fight resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance & Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals

Unit-3: Antibiotic Resistance & Automation Disaster preparedness **14 Hours**

Antibiotic Resistance- History of antibiotics How resistance happens and spreads, Types of resistance- intrinsic, acquired, passive, Trends in drug resistance & Actions to fight resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance & Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals

Fundamentals of emergency management, Psychological impact management, Resource management, Preparedness and risk reduction & Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.

Suggested Reading

1. Summarize Bio medical waste management and environment safety

Name of The Course	Professionalism and values
Course Code	BMLS1007

Prerequisite					
Co-requisite					
Anti-requisite					
		L	T	P	C
		1			1

Course Objectives

1. Outline Personal values & Attitude and behavior
2. Make use of Code of conduct
3. Identify Importance of team efforts

Course Outcomes

CO1	Illustrate Professional values & Attitude and behaviour
CO2	Outline Code of conduct
CO3	Explain the importance of team efforts and Cultural issues

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50			50

Course Content:

Unit-1: Professional values & Attitude and behaviour 3 Hours

Professional values – Integrity, Objectivity, Professional competence and due care, confidentiality, ethical or moral values. Attitude and behaviour – professional behaviour, treating people equally
Unit-2: Code of conduct 6 Hours
Professional accountability and responsibility, misconduct,
Unit-3: Team efforts and Cultural issues
Differences between professions and importance of team efforts and Cultural issues in the healthcare environment

Suggested Reading

1. R. R. Gaur, R. Sangal, G.P. Bagaria, 2009, a Foundation Course in Value Education.
2. E.F. Schumacher, 1973, Small is Beautiful: A study of Economics as if people mattered, Blond & Briggs, Britain.
3. A. Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
4. A.N. Tripathy, 2003, Human Values, New Age International Publishers
5. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
6. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

Name of The Course	Principals of Management with special reference to Medical Laboratory Science (MLS) Management
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Course Code	BMLS1009			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

1. To develop knowledge on basic ethics, good lab practices, quality management system
2. To know the Laboratory Information system (LIS), Hospital Information system (HIS) and financial management.
3. To learn calibration and validation of clinical laboratory instruments

Course Outcomes

CO1	Explain in Basic ethics, good laboratory practices, accreditation of clinical laboratories and safety in the management of clinical samples
CO2	Outline sample accountability & sample analysis and reporting results and the process of quality management system in the laboratory.
CO3	Interpret laboratory Informatorily system, calibration of laboratory instruments & management of financial, biomedical waste in hospital.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

Unit-1: Ethical Principles and standards for a clinical laboratory professional & Good Laboratory Practice (GLP) Regulations and Accreditation Safety in a clinical laboratory 14 Hours

Duty to the patient, Duty to colleagues and other professionals, Duty to the society, Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation.

General safety precautions, HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis. Patient management for clinical samples collection, transportation and preservation.

Unit-2: Sample accountability & Sample analysis and Reporting results & Quality Management system 14 Hours

Purpose of accountability, Methods of accountability, Introduction to sample analysis, Factors affecting sample analysis.

Basic format of a test report, Reported reference range, Clinical Alerts, Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results, Alteration in reports. Introduction to Quality Management system, Quality assurance, Quality control system, Internal and External quality control. Biomedical waste management in a clinical laboratory. Introduction and importance of calibration and Validation of Clinical Laboratory instruments.

Unit-3: Laboratory Information system (LIS), Hospital Information system (HIS) and financial Management & Ethics in Medical laboratory Practice, Procurement of equipment and Inventory Control.14 Hours

Laboratory Information system (LIS), Hospital Information system (HIS) and financial Management: Introduction, Functions of a laboratory management system, Standards for laboratory management system, Introduction and awareness of financial management in a clinical laboratory. Ethics in Medical laboratory Practice: Understanding the term _Ethics, Ethics in relation to the following: Pre-Examination procedures, Examination procedures, Reporting of results, Preserving medical records, Access to Medical laboratory Records. Procurement of equipment and Inventory Control: Audit in a Medical Laboratory, Introduction and Importance: Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation.

Suggested Reading

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur.
2. ICMR guideline for good clinical laboratory practices.
3. Textbook of Preventive & social Medicine by parks 18th edition.
4. NIH: DIADS guidelines for Good Clinical laboratory practice Standards, 2011
5. WHO: Good Clinical laboratory practice Standards.
6. <https://www.cdc.gov/>

Name of The Course	Community orientation and clinical visit
Course Code	BMLS1010
Prerequisite	

Co-requisite				
Anti-requisite				
	L	T	P	C
	1	0	0	1

Course Objectives

1. Apply essential knowledge in the entire chain of health care delivery system
2. Develop Basic knowledge on governance village , panchayat and frontline health workers

Course Outcomes

CO1	Apply essential knowledge in the entire chain of health care delivery system
CO2	Develop Basic knowledge on governance village , panchayat and frontline health workers

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50			50

Course Content:

Unit-1: Community orientation and clinical visit 8 Hours

The community orientation and clinical visit will include visit to the entire chain of the healthcare delivery system – Sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries and clinics.
Unit-2: Clinical visit to their respective professional department. 8 Hours
The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front-line health workers. Clinical visit to their respective professional department within the hospital

	0	0	4	2
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Course Objectives

1. Apply knowledge in instruments/techniques used in analytical biochemistry

Course Outcomes

CO1	Demonstration of basic hardware of the computers and laptops
CO2	Distinguish between MS office: MS word, MS PowerPoint, MS Excel
CO3	Apply knowledge on software installation. Build knowledge on Introduction to MS-Word

Suggested Reading

1. ICMR guideline for good clinical laboratory practices.
2. Textbook of Preventive & social Medicine by parks 18th edition.
3. NIH:DIADS guidelines for Good Clinical laboratory practice Standards,2011
4. WHO: Good Clinical laboratory practice Standards.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

Practical 1: Demonstration of basic hardware of the computers and laptops
Practical 2: Learning to use MS office: MS word, MS PowerPoint, MS Excel
Practical 3: To install different software
Practical 4: Data entry efficiency

Name of The Course	Basic computers and information Science-Practical
Course Code	BMLS1051
Prerequisite	
Co-requisite	
Anti-requisite	
	L T P C

Suggested Reading

1. Computer Fundamentals (Concepts, Systems and applications) by P. K. Sinha (University of Tokyo, Japan) BPB Publications
2. Information technology by Anshuman Sharma (Lakhanpal Publisher)

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

1. General discussion on Medical Terminology and understanding basics of various diseases.
2. Coding
3. Assembling of patient files
4. Sensitization on career opportunities and role of MLS in Hospital Care
5. Visit to working;
6. Microbiology
7. Haematology
8. Biochemistry
9. Histopathology laboratories

Name of The Course	Medical Terminology, Record keeping (including anatomical terms) and Orientation to Medical Laboratory Science (MLS) – Practical			
Course Code	BMLS1053			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. Apply knowledge in Record keeping (including anatomical terms) and Orientation to Medical Laboratory Science

Course Outcomes

CO1	Apply knowledge on medical terminology.
CO2	Outline carrier opportunity and role of MLT in hospital care

Continuous Assessment Pattern**Suggested Reading**

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur.

2. An Introduction to Medical Lab Technology by F J Baker and Silverton

control & Antibiotic Resistance

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
5	10	35	50

Course Content:

<p>I. Quality and Patient safety:</p> <ol style="list-style-type: none"> 1. Discussion on Concepts of Quality of Care 2. Approaches to Quality Improvement 3. Quality Improvement Tools
<p>II. Basics of emergency care and life support skills:</p> <ol style="list-style-type: none"> 1. Vital signs and primary assessment 2. Basic emergency care – first aid and triage 3. Ventilations including use of bag-valve-masks (BVMs) 4. Choking, rescue breathing methods 5. One- and Two-rescuer CPR 6. Using an AED (Automated external defibrillator). 7. Managing an emergency including moving a patient.
<p>III. Bio medical waste management and environment safety-</p> <ol style="list-style-type: none"> 1. Visit to Central Sterile Supply Department (CSSD) 2. Visit to incinerator complex 3. Visit to Immunization section 4. Discussion on Biomedical Waste, 5. Demonstration of Types of waste generated from Health Care Facility 6. Discussion on waste minimization 7. Poster presentation of BMW – Segregation, collection, transportation, treatment and disposal (including color coding) 8. Discussion on Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste 9. Visit to Central Sterile Supply Department for demonstration of BMW Management & methods of

Name of The Course	Introduction to Quality and Patient safety (including Basic emergency care and life support skills, Infection prevention and control, Biomedical waste management, Disaster management and Antibiotic resistance)-Practical			
Course Code	BMLS1054			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. To gain knowledge about patient quality and patient safety & life support skills
2. To learn the Biomedical waste and environment safety, infection prevention and control.

Course Outcomes

CO1	Explain the patient quality and patient safety & life support skills
CO2	Apply knowledge in Biomedical waste and environment safety.
CO3	Apply knowledge in Infection prevention and

disinfection

10. Modern Technology for handling BMW e.g. Incinerator, Shredder etc.

11. Demonstration of proper use of Personal protective equipment (PPE)

12. Demonstration of monitoring & controlling of cross infection (Protective devices).

IV. Infection prevention and control:

1. Demonstration of evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene and use of Personal Protective Equipment (PPE)],

2. Discussion on prevention & control of common healthcare associated infections,

3. Preparing Charts & Posters of Components of an effective infection control program, and

4. Guidelines (NABH and JCI) for Hospital Infection Control

V. Resistance & Disaster preparedness and management

1. Discussion on various types of Antibiotics

2. Demonstration of how Resistance Happens and Spreads

3. Discussion on types of resistance- Intrinsic, Acquired, Passive

4. Antibiotic sensitivity testing

5. Display of Consequences of antibiotic resistance

6. Demonstration of Antimicrobial Barriers and opportunities, Tools and models in hospitals.

7. Discussion on fundamentals of emergency management,

8. Management psychological impact

9. Discussion on;

- Resource management,

- Preparedness and risk reduction.

Suggested Reading

1. The Essentials of Patient Safety by Charles Vincent.

2. Laboratory quality control and patient safety by De Gruyter.

3. <https://www.cdc.gov/>

Name of The Course	Principals of Management with special reference to Medical Laboratory Science (MLS) management-Practical			
Course Code	BMLS1056			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. To learn the procedure of clinical sample collection
2. To gain knowledge in reporting and results, quality management system.

Course Outcomes

CO1	Demonstrate the clinical sample collection.
CO2	To gain knowledge in reporting and results, quality management system.
CO3	Apply knowledge in Biomedical waste management in a clinical laboratory & Ethic in medical laboratory practical.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
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5	10	35	50
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Course Content:

<p>1. Clinical sample collection e.g.</p> <p>1.1 Blood 1.2 Urine 1.3 Stool 1.4 Saliva 1.5 Sputum 1.6 Semen analysis.</p>
<p>2. Sample accountability</p> <p>2.1 Labeling of sample 2.2 Making entries in Laboratory records</p>
<p>3. Reporting results</p> <p>3.1 Basic format of a test report 3.2 Release of examination results 3.3 Alteration in reports</p>
<p>4. Quality Management system</p> <p>4.1 Quality assurance 4.2 Internal and External quality control 4.3 Quality improvement</p>
<p>5. Biomedical waste management in a clinical laboratory - Disposal of used samples, reagents and other biomedical waste.</p>
<p>6. Calibration and Validation of Clinical Laboratory instruments.</p>
<p>7. Ethics in medical laboratory practice in relation to the following:</p> <p>7.1 Pre-Examination procedures 7.2 Examination procedures 7.3 Reporting of results</p>

7.4 Preserving medical records
7.5 Access to medical laboratory records.

Suggested Reading

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur
2. <https://www.who.int/>

Name of The Course	General Medical Microbiology			
Course Code	BMLS2001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. To learn the history, & basics of general medical microbiology, sterilization methods and life cycle of bacteria
2. To gain knowledge on different types of culture media
3. To learn bacterial immunity and different types of animals used in lab for higher studies.

Course Outcomes:

On completion of course student will be able to:

CO1	Demonstrate introduction of medical microbiology and different equipment used in microbiology
CO2	Illustrate & Practice the different types of sterilization and Biomedical waste management

CO3	Explain General characteristics, classification and growth of microbes
CO4	Demonstrate types and use of culture media
CO5	Explain Bacterial immunology and laboratory animal handling and care
CO6	Discuss and improve skills on new diagnostic methods in medical microbiology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to Medical Microbiology 13 Hours
1. Definition, History, Host - Microbe relationship, 2. Safety measures in Clinical Microbiology, 3. Glassware used in Clinical Microbiology Laboratory: Introduction, Care and handling of glassware, Cleaning of glassware, 4. Equipment used in clinical Microbiology Laboratory, Introduction, Care and maintenance including calibration. 5. Microscopy: Introduction and history, Types, principle and operation mechanism of following microscopes, Light microscope, DGI, Fluorescent, Phase contrast, Electron microscope: Transmission/Scanning.

Unit II: Sterilization	12 Hours
Sterilization: Definition, Types and principles of sterilization methods, Heat (dry heat, moist heat with special Reference to autoclave), Radiation, Filtration, Efficiency testing to various sterilizers. 2. Antiseptics and disinfectants: Definition, Types and properties, Mode of action - Uses of various disinfectants, Precautions while using the disinfectants - Qualities of a good disinfectant, Testing efficiency of various disinfectants. 3. Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated – Segregation – Treatment – Disposal	
Unit III: General characteristics & classification of Microbes & Growth	11 hours
1. General characteristics & classification of Microbes: (Bacteria & fungi), Classification of microbes with special reference to prokaryotes & eukaryotes, Morphological classification of bacteria, Bacterial anatomy (Bacterial cell structures). 2. Growth and Nutrition of Microbes: General nutritional & other requirements of the bacteria, Classification of bacteria on the basis of their nutritional requirements, Physical conditions required for growth. Normal growth cycle of bacteria (growth curve) Types of microbial cultures: Synchronous, Static, continuous culture.	
Unit IV: Culture media	11Hours
Culture media: Introduction, Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media, routine/synthetic/defined media, basal media, enriched, enrichment, Selective differential media, sugar fermentation media, transport media,	

preservation media and anaerobic culture media, Quality control in culture media, Automation in culture media preparation, Aerobic & anaerobic culture methods: Concepts, Methods Used for aerobic cultures, Methods used for anaerobic cultures.
Unit V: Immunology & Care of Animal 13Hours
1. Introductions to Immunology, Immunity, Antigens and Antibodies 2. Care & handling of laboratory animals: Introduction, General care & handling, Ethics & legality in use of laboratory animals
Unit VI Recent advance techniques in medical microbiology
New diagnostic methods: Immunoassays, automated and semi-automated systems and Blood culture system.

Suggested Reading

1. Text book of Microbiology by Ananthanarayan
2. Medical Microbiology by Panikar & Satish Gupte
3. Medical laboratory Technology vol. I, II, III by Mukherjee
4. Text book of Microbiology by CP Bhaveja
5. Text book of Microbiology by Prescott
6. Medical Laboratory Technology by Mukherjee

Name of The Course	Basic Haematology			
Course Code	BMLS2002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. Apply knowledge in basic hematology
2. Apply knowledge in blood component and formation
3. Apply knowledge in basic Quality assurance

Course Outcomes

On completion of course student will be able to:

CO1	Demonstrate the basic equipment used in haematology and explain composition of blood
CO2	Apply knowledge on blood and anticoagulant
CO3	Simplify the Hemopoiesis
CO4	Explain Haemostasis and urine analysis

CO5	Apply Knowledge on quality assurance Haematology
CO6	Discuss recently used techniques of blood collection procedures

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to Hematology	12 Hours
Introduction to Hematology Definition Importance Important equipment used Laboratory organization and safety measures in Hematology Laboratory Introduction to blood, its composition, function and normal cellular components.	
Unit II: Blood and Anticoagulant	12 Hours
Introduction to blood, its composition, function and normal cellular components Anticoagulants: types, mode of action and preference of anticoagulants for different haematological studies Collection and preservation of blood sample for various haematological	

investigations.	
Unit III: Hemopoiesis	12 Hours
Formation of cellular components of blood (Hemopoiesis) Erythropoiesis Leucopoiesis Thrombopoiesis Haemoglobin: definition, types, structure, synthesis and degradation Morphology of normal blood cells.	
Unit IV: Haemostasis	12 Hours
Normal Haemostasis & physiological properties of coagulation factors. Radioactivity: definition, half-life, physical decay and units Urine analysis.	
Unit V: Quality assurance	12 Hours
Quality assurance in Haematology Internal and external quality control including reference preparation Routine quality assurance protocol Statistical analysis i.e. Standard deviation, Co-efficient of variation, accuracy and precision.	
Unit VI: Updated Blood Collection procedures	8 Hours
Introduction to Blood Collection, Venepuncture by Vacutainer, Capillary Collection, Blood Culture for Viral Culture, Blood Culture Collection: For Bacterial, Fungal or Mycobacterial Culture	

Suggested Reading

1. Text book of Medical Laboratory Technology by Praful B. Godkar
2. Medical laboratory Technology by K.L. Mukherjee Volume-I
3. Practical Haematology by J.B. Dacie
4. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry
5. Atlas of Haematology (5th edition) by G.A. McDonald.

Name of The Course	Basic Clinical Biochemistry			
Course Code	BMLS2003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

3. To gain knowledge in cleaning of glassware, calibrations, pH meters and its derivation, preparation of various conc. Solutions and distillation plant in biochemistry. Course Outcomes

On completion of course student will be able to:

CO1	Demonstrate and analyse the roles and ethics
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	in MLT with steps of cleaning.
CO2	Demonstrate the various calibrating techniques.
CO3	Apply knowledge on preparation of different types solutions and Working and maintenance of analytical balance
CO4	Explain the concept of maintenance of Blood pH and concept of pH meter.
CO5	Explain the different methods of distilled water preparation and process of osmosis.
CO6	Originate ideas about how to use techniques in field.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to Medical lab. Technology & Cleaning of glassware 12 Hours
Role of Medical lab Technology, Ethics and responsibility, Safety measures, First aid their biochemical findings, Steps involved in cleaning soda lime glass, Steps involved in cleaning borosil glass, Preparation of chromic acid solution and Storage
Unit II: Units of Measurement & Calibration of

volumetric apparatus 12 Hours
S.I unit and CGS units, Conversion, Strength, molecular weight, equivalent weight, Normality, Molarity, Molality, Numerical, Calibration of Flask, Pipettes, Burettes & Cylinders
Unit III: Analytical balance & Volumetric analysis 12 Hours
Analytical Balance Principle, Working and Maintenance, Normal and molar solutions, Standard solutions, Preparation of reagents & Storage of chemicals
Unit IV: Concept of pH 12 Hours
Definition, Henderson Hassel batch equation, Pka value, pH indicator, Methods of measurement of pH, pH paper & pH meter Principle, working, maintenance and calibration of pH meter.
Unit V: Distilled water & Osmosis 12 Hours
Method of preparation of distilled water, Type of water distillation plants, Storage of distilled water, Osmosis Definition, Types of osmosis, Factors affecting osmotic pressure, VantHoff's equation, Applications of osmosis, Dialysis.
Unit VI 8 Hours
Purification ,Centrifugation, Filtration, Dialysis, Homogenization.

Suggested Reading

1. Text book of Medical Laboratory Technology by P. B. Godker

2. Medical Laboratory Technology by K.L. Mukherjee volume III

3. Text book of Medical Biochemistry by Chatterjee, Shinde

4. Biochemistry by Voet & Voet

5. Principles of Biochemistry by M. A. Siddiqi.

Name of The Course	Human Anatomy and Physiology			
Course Code	BMLS2004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. To gain knowledge about cell and cell organelles & Tissues.

2. To learn about muscular skeletal, Respiratory & Cardiovascular system, lymphatic system & sense of organ.

3. To develop knowledge Body fluids and their significance & Digestive system, Liver, Urinary system & Genital system, Nervous system & Endocrine system.

Course Outcomes

CO1	Demonstrate Cell and cell organelles & Tissues.
CO2	Demonstrate the anatomy and physiology of muscular skeletal, Respiratory & Cardiovascular system.
CO3	Apply knowledge in lymphatic system & sense organs.
CO4	Classify the Body fluids and their significance & anatomy and physiology of Digestive system, Liver.
CO5	Explain anatomy and physiology of Urinary system & Genital system, Nervous system & Endocrine system.
CO6	Discuss the anomalies of human body

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I: Introduction to human Anatomy and Physiology, Cell and cell organelles, Tissues, Blood.

12 hours
Introduction to human Anatomy and Physiology: Cell and cell organelles, Structure and classification, Function, Cell division (Mitosis and Meiosis). Tissues: Definition, Classification with structure and Functions, Epithelial tissues, Connective tissues, Muscular tissues, Nervous tissue: Blood: Composition, Function of blood.
Unit II: Muscular skeletal & system, Respiratory system Cardiovascular system. 12 Hours
Muscular skeletal system: Introduction, Classification, Structure and function of skeletal system, muscles and joints, Various movements of body. Respiratory system: Introduction, Structure, Function, Mechanism of breathing and respiration, Various terms involved in respiratory System, Vital capacity, Total Volume, Reserve volume, Total lung capacity. Cardiovascular system: Anatomy and physiology of heart, Blood circulation, Arteries and veins, Conductive system of heart, Cardiac cycle, Introduction to ECG.
Unit III: Lymphatic system & Structure and function of sense organ 12 Hours
Lymphatic system: Introduction, Structure and function, Lymph nodes, Spleen, Thymus gland, Tonsils. Structure and function of sense organ: Eye, Ear, Nose, Tongue.
Unit IV: Body fluids and their significance & Digestive system, Liver 12 Hours
Body fluids and their significance: Important terms, types of body fluid, total body water, avenues by which water leaves and enters body, general principles for

fluid balance, cardinal principle, How body fluids maintain Homeostasis, Electrolytes & ions Function of electrolytes, How electrolyte imbalance leads to fluid imbalance. Digestive system: Organization; accessory organs; structure & function (Mouth, Tongue, Teeth, Oesophagus, Pharynx, Stomach, Intestine, Rectum, Anus); Digestive glands; physiology of digestion of carbohydrates, lipids & proteins. Liver: structure and function.
Unit V: Urinary system & Genital system, Nervous system & Endocrine system. 12 Hours
Urinary system: Main parts, Structure & function of kidney, structure of nephron, physiology of excretion & urine formation, urine, additional excretory organs. Genital system: Structure of male and female reproductive system, Gametogenesis in male & female, menstrual cycle. Placenta and extra embryonic membranes. Nervous system: Parts, function & structure; brain, spinal cord, spinal & cranial nerves; all & none principle, role of neurotransmitters in transmission of nerve impulse, Endocrine system: Endocrine & exocrine glands, their location, structure & functions.
Unit VI Anomalies of human body 8 Hours
Human body anomalies-General, Developmental, Congenital

Suggested Reading

1. Anatomy & Physiology- Ross and Wilson

2. Anatomy and Physiology: Understanding the Human Body by Clark
3. Anatomy and Physiology for nurses by Evelyn Pearce
4. Anatomy and Physiology for nurses by Pearson
5. Anatomy and Physiology by N Murgesh.

5. To get knowledge on bacterial immunology and animal house

Course Outcomes:

On completion of course student will be able to:

CO1	Explain preparation of disinfectants and follow the hygiene techniques in the lab
CO2	Illustrate & Practice the different types of sterilization and microscope
CO3	Demonstrate types and use of culture media
CO4	Demonstrate handling and care of laboratory animals.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical
1. To demonstrate safe code of practice for a Microbiology laboratory
2. To prepare cleaning agents & to study the technique for cleaning & sterilization of

Name of The Course	General Medical Microbiology - (Practical)			
Course Code	BMLS2051			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

1. Apply practical knowledge in General medical microbiology laboratory
2. To practice the practical knowledge in medical microbiology such as microscopic examination
3. To learn the different methods of sterilization and hygiene techniques
4. To prepare different types of culture media and disinfectants solutions.

glassware.
3. To demonstrate the working & handling of Compound microscope.
4. To demonstrate the method of sterilization by autoclave including its efficacy testing.
5. To demonstrate the method of sterilization by hot air oven including its efficacy testing.
6. To demonstrate the method of sterilization of media/solution by filtration.
7. Demonstration of Antiseptics, Spirit, Cetrimide&Povidone-Iodine.
8. To demonstrate the use of disinfectants.
9. Demonstrate the precaution while using disinfectants.
10. To prepare working dilution of commonly used disinfectants.
11. In-use test
12. Rideal-walker phenol co-efficient test.
13. Kelsey-Sykes test

14. To demonstrate the different morphological types of bacteria
15. Preparation of one culture media from each type
16. To demonstrate aerobic culture
17. To demonstrate anaerobic culture
18. Visit to animal house & demonstrate about care of laboratory animals

Suggested Reading

1. Text book of Microbiology by Ananthanarayan
2. Medical Microbiology by Panikar&SatishGupte
3. Medical laboratory Technology vol. I, II, III by Mukherjee
4. Text book of Microbiology by CP Bhaveja
5. Practical Medical Microbiology by Mackie and McCartney

Name of The Course	Basic Haematology – (Practical)
Course Code	BMLS2052
Prerequisite	
Co-requisite	
Anti-requisite	

	L	T	P	C
	-	-	4	2

Course Objectives**1. Apply knowledge in instruments/techniques used in Haematology****Course Outcomes:**

On completion of course student will be able to:

CO1	Demonstrate haematology laboratory equipment and instruments
CO2	Demonstrate blood collection
CO3	Analyse the routine urine investigation

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical

1. Preparation of various anticoagulants: EDTA, Sodium Citrate, Oxalate with Fluoride
2. Collection of blood sample for various Lab Investigations
3. Familiarization and working of routine Haematology Lab. Instruments Microscopes
4. Demonstration of Haemocytometers
5. Demonstration of Colorimeter
6. Demonstration of Spectrophotometer
7. Demonstration of Glass pipettes & Auto pipettes Glassware
8. Demonstration of Sahli's Apparatus
9. Identification of Normal blood cells
10. Urine Analysis: Routine biochemistry of Urine for: pH Specific Gravity
11. Routine biochemistry of Urine for Glucose
12. Routine biochemistry of Urine for Ketones bodies

13. Routine biochemistry of Urine for Bilirubin
14. Routine biochemistry of Urine for Albumin
15. Microscopic Examination of Urine

Course Objectives

1. Apply knowledge in reagent preparation, instruments/techniques used in basic clinical biochemistry

Course Outcomes

CO1	Demonstrate reagent preparation, procedure and principle of distillation & pH meter.
CO2	Demonstrate reagent preparation, procedure and labelling of different concentration of solution.
CO3	Demonstrate different steps involved in osmosis.

Suggested Reading

1. Text book of Medical Laboratory Technology by Praful B. Godkar
2. Medical laboratory Technology by K.L. Mukherjee Volume-I
3. Practical Haematology by J.B. Dacie
4. De Gruchy's Clinical Haematology in Medical Practice
5. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical
1. Cleaning of the laboratory glass ware (Volumetric and non-volumetric)
2. Preparation of distilled water

Name of The Course	Basic Clinical Biochemistry – Practical			
Course Code	BMLS2053			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	2	1

3. Principle, working and maintenance of pH meter.
4. To prepare 0.1 N NaOH solution.
5. To prepare 0.2N HCl solution.
6. To prepare 0.1 molar H ₂ SO ₄
7. To prepare 0.2 Molar Sodium carbonate solution.
8. Demonstration of osmosis and dialysis.

Name of The Course	Human Anatomy and Physiology – (Practical)			
Course Code	BMLS2054			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

1. To learn various parts of body, tissues, digestive system, respiratory system & Skin
2. To develop skills to prepare models & charts of parts of excretory system, Circulatory system from models.
3. To gain knowledge in Genital system, Nervous system & body fluids.

Course Outcomes

CO1	Demonstrate the anatomy of various organ systems of body
CO2	Demonstration anatomy of different bones and joints.
CO3	Demonstrate anatomy and physiology of different system by using different models and charts.

Suggested Reading

1. Text book of Medical Laboratory Technology by P. B. Godker
2. Medical Laboratory Technology by K.L. Mukherjee volume III
3. Text book of Medical Biochemistry by Chatterjee, Shinde
4. Practical Clinical Biochemistry by Harold Varley.
5. Principal of Biochemistry by M. A. Siddiqi

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Practical
1. Demonstration of various parts of body
2. Demonstration of tissues of body
3. Demonstration of parts of digestive system
4. Demonstration of parts of respiratory system
5. Demonstration of parts of skin

6. Demonstration of parts of excretory system
7. Demonstration of various parts of circulatory system (Demonstration from models)
8. Examination of blood film for various blood cells from stained slides
9. Blood pressure estimation
10. Demonstration of various parts of nervous system (brain and spinal cord)(Model)
11. Structure of eye and ear (demonstration from models)
12. Demonstration of reflex action
13. Demonstration of structural differences between skeletal, smooth and cardiac muscles (permanent mounts)
14. Demonstration of various bones and joints
15. Demonstration of various parts of reproductive system (Male and female from models and charts)
16. To study circulatory system from charts and transverse section (TS) of artery and vein from permanent slides.

17. To study digestive system from charts and TS of liver, spleen and pancreas from permanent slides.
18. Study of Urinary system (charts)
19. Study of Genital system (male & female) from charts and TS of testis and ovary from permanent slides.
20. To study nervous system (From models / charts)
21. To study various body fluids.

Suggested Reading

- 1. William Davis, Understanding Human Anatomy and Physiology, McGraw Hill.**
- 2. Anatomy & Physiology- Ross and Wilson**
- 3. Anatomy and Physiology: Understanding the Human Body by Clark**
- 4. Chaurasia's, Practical of Human Anatomy.**

Name of The Course	Systemic Bacteriology			
Course Code	BMLS3001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. Apply knowledge in General medical microbiology
2. To learn morphological characteristics of bacteria by staining
3. To develop the brief knowledge in pathogenesis and laboratory diagnosis of gram positive and gram negative bacteria
4. to know the mycobacterium and spirochetes pathogenesis and laboratory diagnosis
5. Discuss recent advance techniques for bacteria identification

Course Outcomes

CO1	Demonstrate and perform bacterial Culture and staining techniques for identification of bacteria
CO2	Explain principle and procedure of Biochemical examinations
CO3	Illustrate pathogenesis and laboratory

	diagnosis of Cocci
CO4	Illustrate pathogenesis and laboratory diagnosis of Bacilli
CO5	Explain classification, pathogenesis and lab diagnosis of Spirochetes
CO6	Modify recent advance techniques for bacterial identification.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<p>Unit-1 Bacterial culture and Staining hours : 12</p> <p>1. Instruments used to seed culture media, Culture procedures – seeding a plate</p> <p>2. Staining techniques in bacteriology: Significance of staining in bacteriology, Principle, Reagent preparation, procedures and interpretation of the following, Simple staining, Negative staining, Gram stain, Albert's stain, Neisser's stain, Ziehl –Neelsen staining, Capsule staining, Flagella staining, Spore staining and Fontana stain for spirochetes</p>
<p>Unit-2 biochemical tests for identification of different bacteria. Hours 11</p>

Principle, procedures and interpretation of the following biochemical tests for identification of different bacteria. Catalase, Coagulase, Indole, Methyl Red, Voges-Proskauer, Urease, Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation, Huger and Leifson, Bile solubility, H ₂ S production, Demonstration of motility, Decarboxylases, CAMP, Hippurate hydrolysis, Nagler's reaction and Cholera-red reaction	
Unit-3	hours 12
Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria: 1. Staphylococcus, 2. Streptococcus, 3. Pneumococcus, 4. Neisseria gonorrhoea and Neisseria meningitis, 5. Haemophili's and 6. Corynebacterium	
Unit-4	hours 13
Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria: 1. Enterobacteriaceae: Escherichia coli, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia enterocolitica and Yersinia pestis, 2. Vibrio, Aeromonas and Plesiomonas, 3. Clostridia of wound infection and 4. Mycobacterium tuberculosis complex, Atypical Mycobacteria and M. leprae	

Unit-5	hours 12
Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria: 1. Spirochetes – Treponema, Borrelia and leptospira, 2. Bordetella and brucella, 3. Mycoplasma and Ureaplasma, 4. Rickettsia, 5. Chlamydia, 6. Actinomyces, 7. Pseudomonas and Burkholderia and 8. Brief introduction about non sporing anaerobic cocci and bacilli	
Unit-6: Advance techniques in systemic bacteriology hours 8	
Specimen collection from different areas from the human body for bacterial diagnosis Advance instrument used in Bacteriology: CMIA, ViteK, BacT Alert 3D system.	

Suggested Reading

1. Text book of Microbiology by Ananthanarayan
2. Medical Microbiology by Panikar & SatishGupte
3. Medical laboratory Technology vol. I, II, III by Mukherjee
4. Text book of Microbiology by CP Bhaveja
5. Text book of Microbiology by Prescott
6. Medical Laboratory Technology by Mukherjee
7. Practical Medical Microbiology by Mackie and McCartney

Name of The Course	Basics of Haematological diseases
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Course Code	BMLS3002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives**1. Apply knowledge on haematological disease****Course Outcomes**

CO1	Apply knowledge about anaemia
CO2	Apply knowledge on leucocytes disorder
CO3	Examine the granulocytes defects
CO4	Classify and interpret bleeding disorders
CO5	Analyse the causes of thrombosis and apply knowledge on different anticoagulants
CO6	Discuss newly diagnosed haematological diseases

Continuous Assessment Pattern

Internal	Mid Term	End Term	Total Marks
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Assessment (IA)	Exam (MTE)	Exam (ETE)	
10	20	70	100

Course Content:

Unit-1 hours : 12 Anaemia
Anaemia Introduction Classification Microcytic hypochromic anaemia Macrocytic anaemia, Normocytic normochromic anaemia
Unit-2 Disorders of Leukocytes Hours 11
Quantitative disorders of Leukocytes Cause and significance Granulocytic and Monocytic Disorders Lymphocytic Disorders
Unit-3 Alterations in Neutrophils hours 12
Morphologic Alterations in Neutrophils Toxic granulation Cytoplasmic vacuoles Döhle bodies May–Hegglin anomaly Alder–Reilly anomaly Pelger–Huët anomaly Chédiak–Higashi syndrome
Unit-4 Bleeding disorders hours 12
Bleeding disorders Introduction Causes of bleeding disorders Vascular defect Platelet defect Factor deficiency Inhibitors Hyper fibrinolysis Types of bleeding disorders Inherited bleeding disorders

Acquired bleeding disorders				
Unit-5	Thrombosis			
hours 12				
Thrombosis Introduction, Causes of thrombosis Monitoring of Anticoagulants, Oral anticoagulants by INR Heparin.				
Unit-6	Newly	diagnosed	haematological	diseases
hours 8				
Introduction of Oral disorders with Haematological diseases, stimulated salivary flow rate (SSFR); decayed, missing and filled teeth (DMFT) index.				

Name of The Course	Basic Clinical Biochemistry			
Course Code	BMLS2003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. To understand various metabolism process related to carbohydrates.
2. To understand various metabolism process related to protein.
3. To gain knowledge and solve on various metabolism process related to lipid.
4. To gain knowledge and solve on various metabolism process related to nucleic acids.
5. To understand the importance and concept of enzymes.

Course Outcomes

Suggested Reading

1. Text book of Medical Laboratory Technology by Praful B. Godkar
2. Medical laboratory Technology by K.L. Mukherjee Volume-I
3. Practical Haematology by J.B. Dacie
4. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry
5. Atlas of Haematology (5th edition) by G.A. McDonald
6. De Gruchy's Clinical Haematology in Medical Practice
7. Wintrobe's Clinical Haematology– 2013 by John P. Greer, Daniel A. Arber, Bertil E. Glader, Alan F. List
8. <https://doi.org/10.1007/s00784-019-03178-3>

CO1	Apply knowledge on metabolism related to carbohydrates.
CO2	Apply knowledge on metabolism of protein.
CO3	Apply knowledge on metabolism to lipid.
CO4	Apply knowledge on metabolism of Nucleic acid
CO5	Apply knowledge on metabolism concept of enzymes and enzyme kinetics
CO6	Discuss the Laboratory diagnostic approaches in metabolic disorders

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-1 hours : 12 Carbohydrate metabolism
Introduction, Importance and Classification, Digestion and Absorption, Metabolism: - Glycolysis, Citric acid cycle, Gluconeogenesis, Glycogenolysis, Glycogenesis, Disorders of carbohydrate metabolism.
Unit-2 Protein metabolism

Hours 12
Introduction, Importance and classification, Important properties of proteins, Digestion & absorption of Proteins, Protein synthesis, Metabolism of proteins, Disorders of protein metabolism and Urea Cycle
Unit-3 Lipid hours 12
Introduction & Classification, Digestion & absorption of fats, Lipoproteins, Fatty acid biosynthesis & fatty acid oxidation
Unit-4 nucleic acid hours 12
Introduction, Functions of Nucleic acid, Functions of energy carriers
Unit-5 enzymes hours 12
Introductions, Importance & Classifications, Properties of enzymes, Mechanism of enzyme action, Factors affecting enzyme action, Enzyme kinetics & enzyme inhibitors
Unit-6 hours-8

Laboratory diagnostic approaches in metabolic disorders, Diagnostic Advancement in Evaluating Inborn Errors of Metabolism

Suggested Reading

1. Text book of Medical Laboratory Technology by P. B. Godker
2. Text book of Biochemistry by U. Satyanarayana & U. Chakrapani
3. Text book of Medical Biochemistry by Chatterjee, Shinde
4. Biochemistry by Voet & Voet
5. Biochemistry by Stryer
6. Principles of Biochemistry by Lehninger

Name of The Course	Fundamentals of Histology			
Course Code	BMLS3004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	-	-	3

Course Objective

Apply knowledge in disorder of the body organ and system

Course Outcomes

CO1	Outline the Alimentary and digestive system disease
CO2	Apply knowledge on digestive gland disease
CO3	Interpretation of the respiratory and excretory system disorder
CO4	Interpretation of the reproductive and nervous system disorder
CO5	Interpretation of the endocrine system disorder
CO6	Elaborate the endoscopy

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-1
hours : 8

Alimentary System: Diseases of mouth, Diseases of Oesophagus- Oesophageal varices.
Digestive System: Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal obstructions & mal absorption.

	L	T	P	C
	3	-	-	3

Course Objectives

Apply knowledge in blood banking and blood transfusion

Course Outcomes

CO1	Outline the blood banking ,ABO grouping & Rh grouping.
CO2	Demonstrate Compatibility test and cross match
CO3	Explain the blood component separation for transfusion and therapeutic purposes
CO4	Apply knowledge on fundamental concept of Genetics
CO5	Explain basic concept of molecular genetics and apply knowledge on Human, Microbial genetics
CO6	Develop skills in handling advanced techniques in Blood banking

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-1 hours : 8

Introduction to Blood Banking
History and discovery of various blood group systems
ABO blood group system Rh and other major blood group system
Sources of error in blood grouping and their elimination.
ABO grouping: Forward and reverse grouping. Causes of discrimination between forward and reverse grouping
Rh grouping

Unit-2 Hours 8

Compatibility test in blood transfusion
Collection of blood for cross matching from a blood bag, Major cross matching, Minor cross matching, Use of enzymes in blood bank specially Papain, Complications and hazards of blood transfusion, Laboratory investigations of transfusion reactions and mismatched blood transfusion, Precautions while procurement and storage of grouping antisera

Unit-3 hours 8

Various anticoagulants used to collect blood for transfusion purposes Selection of donor and procedure for collection of blood from a healthy donor
Preparation of various fractions of blood for transfusion and therapeutic purposes such as: Packed red cells, washed red cells and FROZEN Red cells, Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets, Fresh plasma (FP),

Fresh Frozen Plasma (FFP) and cryoprecipitate, Brief introduction of blood substitute/artificial blood. Haemopheresis: pertaining to Leucocytes, platelets and plasma. Quality control in blood bank

**Unit-4
hours 8**

Continuity of life-heredity, variation; Mendel's laws of inheritance, Chromosomal basis of inheritance; other patterns of inheritance- incomplete dominance, multi parallelism, quantitative inheritance. Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination

**Unit-5
hours 8**

Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids Human Genetics Microbial genetics

**Unit-6 Recent techniques used in blood bank
hours 8**

Automation-solid phase technology, Gel Technology, Affinity Column Technology. Haemopheresis: pertaining to Leucocytes, platelets and plasma.

Suggested Reading

1. Anatomy & Physiology – Ross and Wilson
2. Human Anatomy and Physiology by Pearce
3. Di Fiore's Atlas of Histology

4. Medical Laboratory Technology by KL Mukherjee- Volume III
5. Text book of Pathology by Robbins
6. Textbook of Transfusion Science by Overfield, Hamer.
7. Phyllis S. Walker, MS, MT(ASCP)SBB

Name of The Course	Systemic Bacteriology – Practical			
Course Code	BMLS3051			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

1. Apply practical knowledge in systemic bacteriology laboratory
2. To learn morphological characteristics of bacteria by staining and culture methods
3. To develop the brief knowledge on Biochemical examinations for identification of bacteria
4. To know the identification and isolation from commonly isolated clinical samples

Course Outcomes

CO1	Apply practical knowledge in systemic bacteriology laboratory		demonstrate negative staining
CO2	Examine morphological characteristics of bacteria by staining and culture methods		Bacterial identification: To demonstrate reagent preparation, procedure and interpretation for
CO3	Develop the brief knowledge on Biochemical examinations for identification of bacteria	6	Gram stain
		7	Albert stain
CO4	Demonstrate the bacterial identification and isolation from commonly isolated clinical samples	8	Neisser's staining

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments			
1	To demonstrate the instruments used to seed culture media	12	Spore staining
2	To learn techniques for Inoculation of bacteria on culture media	13	To demonstrate spirochetes by Fontana staining procedure
3	To isolate specific bacteria from a mixture of organisms		To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria
4	To demonstrate simple staining (Methylene blue)	14	Catalase
		15	Coagulase
5	To prepare India ink preparation to	16	Indole

17	Methyl Red (MR)		To demonstrate various characteristics (morphological, cultural and biochemical) of bacteria commonly isolated from clinical samples i.e.
18	VogesProskauer (VP)		
19	Urease	33	Staphylococcus
20	Citrate	34	Streptococcus
21	Oxidase	35	Corynebacterium
22	TSIA	36	Escherichia coli
23	Nitrate reduction	37	Klebsiella
24	Carbohydrate fermentation	38	Citrobacter
25	Huge and Leifson	39	Enterobacter
26	Bile solubility	40	Proteus
27	H ₂ S production	41	Salmonella
28	Demonstration and motility	42	Shigella
29	Decarboxylases	43	Vibrio cholera
30	CAMP	44	Mycobacterium tuberculosis
31	Hippurate hydrolysis	45	Pseudomonas
32	Nagler's reaction	Suggested Reading	

1. Text book of Microbiology by Ananthanarayan
2. Medical Microbiology by Panikar&SatishGupte
3. Medical laboratory Technology vol. I, II, III by Mukherjee
4. Text book of Microbiology by CP Bhaveja
5. Text book of Microbiology by Prescott
6. Medical Laboratory Technology by Mukherjee
7. Practical Medical Microbiology by Mackie and McCartney

CO1	Demonstrate Haematology instruments usage and maintenance
CO2	Demonstrate different blood cell counts and normal and abnormal morphology
CO3	Demonstration of different stains used in haematology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	Parts of microscope; its functioning and care
2	Parts of centrifuge; its functioning and care
3	Familiarization and working of routine Haematology Lab. Instruments Microscopes
4	Cleaning and drying of glassware
5	Preparation of various anticoagulants
6	Collection of venous and capillary blood

Name of The Course	Basics of Haematological diseases – (Practical)			
Course Code	BMLS3052			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

Apply knowledge in instruments/techniques used in Haematology

Course Outcomes

7	Preparation of the stains and other reagents
8	Preparation of peripheral blood film (PBF)
9	Staining of PBF
10	Haemoglobin estimation methods (Sahli's, Oxyhaemoglobin, and cyanmethaemoglobin)
11	Differential leukocyte count (DLC)
12	Recognition and staining of various types of blood cells (normal and abnormal)
13	Preparation of thick and thin blood smear for malarial parasite (Leishman/Giemsa/JSB)
14	RBC counting
15	WBC counting
16	Platelet counting
17	Routine Examination of urine

Suggested Reading

1. Text book of Medical Laboratory Technology by Praful B. Godkar
2. Medical laboratory Technology by K.L. Mukherjee Volume-I
3. Practical Haematology by J.B. Dacie

4. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry
5. Atlas of Haematology (5th edition) by G.A. McDonald
6. De Gruchy's Clinical Haematology in Medical Practice

Name of The Course	Biochemical metabolism – Practical			
Course Code	BMLS3053			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

Apply knowledge in identification of carbohydrates and various biochemical test perform under biochemistry lab.

Course Outcomes

CO1	Determine the qualitative analysis of carbohydrates.
CO2	Determine and demonstrate the kidney function test
CO3	Estimate the cholesterol and its significance

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Suggested Reading

1. Textbook of Biochemistry by U. Satyanarayana & U. Chakrapani
2. Text book of Medical Laboratory Technology by P. B. Godker
3. Medical Laboratory Technology by Mukherjee
4. Principal of Biochemistry by Lehninger
5. Principal of Biochemistry by M. A. Siddiqi

Course Content:

List of Experiments	
1	To study squamous cell from cheek cells (Buccal mucosa)
2	To study stained slide preparation from organs of digestive system
3	Study of stained slides of liver, pancreas, gall bladder
4	Study of various types of microscope and draw diagram in practical notebook

5	To study stained slide preparation from organs of circulatory system
6	To study stained slide preparation from organs of Respiratory system
7	To study stained slide preparation from organs of Nervous system
8	To study stained slide preparation from organs of Urinary system
9	To study stained slide preparation from organs of Endocrine system

Name of The Course	Fundamentals of Histology – (Practical)			
Course Code	BMLS3054			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	2	1

Course Objectives

Apply knowledge in disorder of body organ and system

Course Outcomes

CO1	To study squamous cell from cheek cells
CO2	Apply knowledge on preparation of slides from various organs and how to study organ slides

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	To determine the presence of carbohydrates by Molisch test.
2	To determine the presence of reducing sugar by Fehling solutions
3	To determine the presence of reducing sugar by Benedict's method.
4	To determine starch by Iodine test.
5	Determination of Glucose in serum & plasma
6	Estimates of blood Glucose by Folin & Wu method
7	Determination of Urea in serum, plasma & urine.

8	Determination of Creatinine in serum or plasma
9	Determination of serum Albumin
10	Determination of Cholesterol in serum or plasma

Suggested Reading

- Anatomy & Physiology – Ross and Wilson
- Human Anatomy and Physiology by Pearce
- Di Fiore's Atlas of Histology
- Medical Laboratory Technology by KL Mukherjee-Volume III

Name of The Course	Blood Banking & Genetics-(Practical)			
Course Code	BMLS3055			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	2	1

Course Objectives

Apply knowledge in disorder of body organ and system

Course Outcomes

CO1	Demonstration of blood bags anticoagulants preparation for transfusion
CO2	Demonstrate Screening test for donar blood
CO3	Demonstration of component separation

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	Prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
2	Screening of blood donor: physical examination including medical history of the donor
3	Collection and preservation of blood for transfusion purpose
4	Screening of blood for Malaria, Microfilaria, HBsAg, syphilis and HIV
5	Determine the ABO & Rh grouping
6	Perform Direct and Indirect Coomb's test

7	Perform cross matching (Major & Minor)
8	Demonstration of component separation

Suggested Reading

- Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein
- Practical haematology by JB Dacie
- Transfusion Science by Overfield, Hamer
- Medical laboratory Technology by KL Mukherjee Volume-I
- Medical Laboratory Technology by Mukherjee

Name of The Course	Applied Bacteriology			
Course Code	BMLS4001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. To learn the diagnosis methods of bacterial infection in human
2. To gain knowledge on different types of quality checking methods for Water, food and Air
3. To learn types of nosocomial infection and microbes preservation methods.

Course Outcomes

On completion of course student will be able to:

CO1	Demonstrate and perform bacterial Culture and staining techniques for identification of bacteria
CO2	Explain principle and procedure of Biochemical examinations
CO3	Illustrate pathogenesis and laboratory diagnosis of Cocci
CO4	Illustrate pathogenesis and laboratory diagnosis of

	Bacilli
CO5	Explain classification, pathogenesis and lab diagnosis of Spirochetes
CO6	Develop knowledge on research on recent outbreaks bacterial infections

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I:	Hours: 13
Laboratory strategy in the diagnosis of various infective syndromes: Samples of choice, collection, transportation and processing of samples for laboratory diagnosis of the following complications: Septicaemia and bacteraemia, Upper Respiratory tract infections, Lower respiratory tract infections, Wound, skin, and deep sepsis, Urinary tract infections, Genital Tract infections, Meningitis, Gastrointestinal infections, Enteric fever, Tuberculosis (Pulmonary and Extra-pulmonary) and Pyrexia of unknown origin	
Unit II	11 Hours
Antibiotic susceptibility testing in bacteriology: Definition of antibiotics, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculum, Control bacterial strains, Choice of antibiotics, MIC and MBC: Concepts and methods for determination, Various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method., Sterility testing of I/v fluids: Collection, transportation and processing of I/v fluids for bacterial contamination,	

Recording the result and interpretation	
Unit III:	9 Hours
Basics of Nucleic acid techniques in diagnostic microbiology with special reference to Polymerase chain reaction (PCR)., Automation in bacterial culture detection and antimicrobial susceptibility testing: Principles and importance.	
Unit IV:	15 Hours
Examination of water: Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of fecal contamination, Membrane filtration tests, Interpretation of result., Examination of Milk and milk products: Basic Concepts regarding gradation of milk, Various tests for Bacteriological examination of milk., Examination of food articles: Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc, Various tests for Bacteriological examination with special reference to food poisoning bacteria., Examination of Air: Significance of air bacteriology in healthcare facilities, Settle plate method, Types of air sampling instruments, Collection processing and reporting of an air sample.	
Unit V:	12Hours
Nosocomial Infection: Introduction, sources and types of nosocomial infections. Surveillance of hospital environment for microbial load and Role of microbiology laboratory in control of nosocomial infections. Epidemiological markers: Introduction, Types, Serotyping, Phage typing and Bacteriocin typing. Preservation methods for microbes: Basic concepts of preservation of microbes, Why do we need to preserve bacteria? Principle and procedures of various short term and long term preservation methods with special	

reference to Lyophilization	
Unit VI	8 Hours
Molecular Analysis of Resistance Determinants in Diarrhea an Abundance of Resistance Genes and the Potential Role of the Microbiota in Its Dissemination	

Suggested Reading

1. Text book of Microbiology by Ananthanarayan
2. Medical Microbiology by Panikar & Satish Gupte
3. Text book of Microbiology by Prescott
4. Medical Laboratory Technology by Mukherjee
5. Text book of Microbiology by CP Bhavaja

Name of The Course	Applied Haematology – I			
Course Code	BMLS4002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	-	-	3

Course Objectives

1. Apply knowledge in estimation of blood component**Course Outcomes**

On completion of course student will be able to:

CO1	Demonstrate the haemoglobin and blood cell count
CO2	Explain estimation of ESR, PCV and haematocrit values
CO3	Examine the blood cells by using different stains
CO4	Interpretation of Normal and absolute values in Haematology and examination of semen
CO5	Apply knowledge and examine body fluid and coagulation study
CO6	Discuss recent advancements in haematology analysers

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

<p>Unit I: Haemoglobinometry, Haemocytometer & Haemocytometer Hours: 8</p> <p>Haemoglobinometry: Different methods to measure Haemoglobin with merits and demerits Haemocytometer: Introduction, Principle, Reagent preparation, procedure, errors involved and means to minimize errors. RBC Count,</p>
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Total leucocytes count (TLC), Platelet Count. Absolute Eosinophil count

Unit II: ESR, PCV, & Haematocrit**8 Hours**

Principle mechanism and different methods with merit and demerits for the measuring Erythrocyte Sedimentation Rate (ESR) and its significance Different methods with merit and demerits for packed cell volume/ Haematocrit value Preparation of blood films Types, Methods of preparation (Thick and thin smear/film) and utility

Unit III: Staining techniques**Hours: 8**

Staining techniques in Haematology (Romanowsky's stains): Principle, composition, preparation of staining reagents and procedure of the following Giemsa's stain, Leishman's stain Wright's stain Field's stain JSB stain. Differential leucocytes count (DLC).

Unit IV: Normal and absolute values in Haematology
Hours 8

Normal and absolute values in Haematology
Physiological variations in Hb, PCV, TLC and Platelets
Macroscopic and microscopic examination of seminal fluid

Unit V: Examination of body fluids**Hours 3**

Examination of CSF and other body fluids for cytology i.e. pleural, peritoneal and synovial fluid etc. Preparation of Reagents for coagulation studies: M/40 Calcium chloride Brain Thromboplastin Cephalin Adsorbed Plasma Screening

Tests for coagulation Studies and their significance
Unit VI:RecentHaematology Analyzer Hours 8
Introduction of Haematologyanalyser , Sysmex XN-9000 haematology system, Validating auto verification, Rule for haematologyanalyser.

	3	-	-	3
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Course Objectives

1.Apply knowledge in instruments /techniques used in analytical biochemistry

Course Outcomes

On completion of course student will be able to:

CO1	Demonstrate different type of spectrophotometer and colorimeter.
CO2	Demonstrate various parts and working of photometry.
CO3	Apply knowledge on different types of chromatography.
CO4	Apply knowledge and perform different types of chromatography with its application and working.
CO5	Explain and perform different types of Electrophoresis.
CO6	Maximize the use of new developed technique in gene editing therapy.

Suggested Reading

1.Text book of Medical Laboratory Technology by Praful B. Godkar

2.Medical laboratory Technology by K.L. Mukherjee Volume-I

3.PracticalHaematology by J.B. Dacie

4.Clinical Diagnosis &Management by Laboratory methods (20th edition) by John Bernard Henry

5.DeGruchy's Clinical Haematology in Medical Practice

Name of The Course	Analytical Clinical Biochemistry
Course Code	BMLS4003
Prerequisite	
Co-requisite	
Anti-requisite	
	L T P C

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I:	Hours: 8
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Introduction, Theory of spectrophotometry and colorimetry, Lambert`s law and Beer`s law, Applications of colorimetry and spectrophotometry	
Unit II:	8 Hours
Introduction, General principles of flame photometry, Limitations of flame photometry, Instrumentation, Applications of flame photometry, Atomic absorption spectroscopy – Principle & applications	
Unit III	Hours 8
Introduction, Types of chromatography, Paper Chromatography: Introduction, principle, types, details for qualitative and quantitative analysis, application, Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography, Column chromatography: Introduction, principle column efficiency, application of column chromatography	
Unit IV:	Hours 8
Gas chromatography: Introduction principle, instrumentation, application, Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application, Gel Chromatography: Introduction Principle and method, application and advantages	
Unit V:	Hours 8
Introduction, Principle, Instrumentation, Applications, Types of electrophoresis, Paper electrophoresis, Gel electrophoresis	
Unit VI	Hours 8

Introduction, History, classification of CRISPR, CRISPER Case9, Mechanism, biological structure, Application.

Suggested Reading

1. Instrumental Analysis by Chatwal Anand
2. Text book of Medical Biochemistry by Chatterjee, Shinde
3. Text book of Medical Laboratory Technology by P. B. Godker
4. Principal of Biochemistry by M. A. Siddiqi
5. Practical Clinical Biochemistry by Harold Varley

Name of The Course	BMLS4004 Applied Histopathology – I			
Course Code	BMLS4004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	-	-	4

Course Objectives

1. Apply knowledge in instruments/techniques used in histopathology

Course Outcomes

On completion of course student will be able to:

CO1	Illustrate working principle ,applications of various types of microscopes
CO2	Demonstrate the routine methods of tissue examination and collection, transport of specimens
CO3	Classify the fixative and explain decalcification technique
CO4	Explain the tissue processing and section cutting technique
CO5	Explain the staining and mounting technique
CO6	Discuss the advancements of automation in histopathology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I:	Hours 12
Compound microscope: Optical system, magnification and maintenance. Microscopy: Working principle Applications of various types of microscopes i.e. dark field, polarizing, phase contrast, interference and fluorescent microscope	
Unit II:	Hours 12

Safety measures in a histopathology laboratory, Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination

Unit III: Hours 12

Basic concepts of fixation Various types of fixatives used in a routine histopathology laboratory Simple fixatives Compound fixatives Special fixatives for demonstration of various tissue elements, Decalcification Criteria of a good decalcification agent Technique of decalcification followed with selection of tissue, fixation, and de calcification, neutralization of acid and thorough washing Various types of decalcifying fluids: Organic & Inorganic Acid, chelating agents, Use of Ion-exchange resins and Electrophoretic decalcification and treatment of hard tissues which are not calcified

Unit IV: Hours 12

Processing of various tissues for histological examination Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue processing. Components & principles of various types of automatic tissue Processors Embedding: Definition Various types of embedding media, Section Cutting Introduction regarding equipment used for sectioning Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications Freezing Microtome and various types of Cryostats. Faults in paraffin section cutting with reason and remedy, spreading the sections and attachment or mounting of sections to glass slides.

Unit V : Hours 12

Staining, Impregnation and Mountants Theory of Staining, Classifications of Dyes, Principles of Dye Chemistry Stains

and Dyes and their uses Types of Stains, Chemical Staining Action, Mordants and Accentuators, Metachromasia Use of Controls in Staining Procedures Preparation of Stains, solvents, aniline water and buffers etc. Commonly used mountants in histotechnology lab General Staining Procedures for Paraffin Infiltrated and Embedded tissue Nuclear Stains and Cytoplasmic stains. Equipment and Procedure for manual Staining and Automatic Staining Technique. Mounting of Cover Slips, Labelling and Cataloguing the Slides. Routine Staining Procedures Haematoxylin and Eosin Staining, various types of Haematoxylin Mallory's, Phosphotungstic Acid Haematoxylin (PTAH)
Unit VI :Advancements in Histopathology Hours 8
Introduction to Automation in histopathology, fully automation in histopathology, quality control in histopathology

Suggested Reading

1. Handbook of Histopathological Techniques by C F A Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by F J Baker and Silvertown
4. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

Name of The Course	Medical Mycology and Virology
Course Code	BMLS4005
Prerequisite	

Co-requisite				
Anti-requisite				
		L	T	P
		4	-	4

Course Objectives

1. To learn the basic characteristics of virus and diagnosis of virus
2. To gain knowledge on fungi infections and diagnosis methods
3. To develop knowledge on recent advance techniques

Course Outcomes

On completion of course student will be able to:

CO1	Apply knowledge on basic characteristics of virus, collection, transport of viral specimens
CO2	Illustrate and perform diagnosis of virus
CO3	Explain the basic concept of fungal infections in human body.
CO4	Explain culture media, Techniques used for isolation and identification methods of fungi
CO5	Explain susceptibility tests and serological diagnosis for fungi
CO6	Discuss on specimen collection and diagnosis of recent outbreaks in virus and fungal infections

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit I:	Hours 12
Introduction to medical virology, Introduction to medically important viruses, Structure and Classification of viruses., Multiplication of viruses., Collection, transportation and storage of sample for viral diagnosis	
Unit II:	Hours 14
Staining techniques used in Virology., Processing of samples for viral culture (Egg inoculation and tissue culture)., Rapid diagnosis of viral infections with special reference to HIV, HBV and HCV., EIA., Immunofluorescence and PCR	
Unit III:	Hours 10
Introduction to Medical Mycology, Basic concepts about superficial and deep Mycoses, Taxonomy and classification and general characteristics of various medically important fungi, Normal fungal flora, Morphological, cultural characteristics of common fungal laboratory contaminants	
Unit IV:	Hours 12
Culture media used in mycology, Direct microscopy in Medical mycology laboratory, Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids, Techniques used for isolation and identification of medically important fungi and Methods for identification of yeasts and moulds	

Unit V:	Hours 12
Dimorphism in fungi., Antifungal susceptibility tests., Preservation of fungal cultures., Routine myco-serological tests and skin tests	
Unit VI	Hours 8
Recent pandemic outbreaks of virus and fungal infections-clinical specimen collection and diagnosis	

Suggested Reading

1. Text book of Microbiology by Ananthanarayan
2. Medical Microbiology by Panikar & Satish Gupte
3. Text book of Microbiology by CP Bhavaja
4. Medical Laboratory Technology by Mukherjee
5. Medical Mycology by Dr. Jagdish Chander

Name of The Course	Applied Bacteriology – practical			
Course Code	BMLS4051			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

1. Apply practical knowledge in Applied bacteriology laboratory

2. To learn identification of pathogenic bacteria from clinical sample, water, air, food and milk

3. To develop the brief knowledge on Antibiotic sensitivity test for identification of bacteria

Course Outcomes

On completion of course student will be able to:

CO1	Demonstration and identification of pathogenic bacteria from clinical sample.
CO2	Illustrate and perform antibiotic sensitivity test and PCR for identification of bacteria.
CO3	To develop the brief knowledge on Antibiotic sensitivity test for identification of bacteria

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	Inoculation of different culture media

2	Isolation of pure cultures
Processing of following clinical samples for culture and identification of bacterial pathogens:	
3	Blood
4	Throat swab
5	Sputum
6	Pus
7	Urine
8	Stool for Salmonella, Shigella and Vibrio cholerae
9	C.S.F.
10	Demonstration of PCR
11	Demonstration of automation in bacterial culture detection and antimicrobial susceptibility testing
Antimicrobial susceptibility testing	
13	Introduction and terms used
14	Preparation and standardization of inoculum

15	To demonstrate reference bacterial strains
16	To determine MIC and MBC of known bacteria against a known antibiotic
17	To perform antibiotic susceptibility testing of clinical isolates by using Stokes method
18	To perform antibiotic susceptibility testing of clinical isolates by using Kirby-Bauer method
	Collection, transportation and processing of following articles for bacteriological examination:
19	Water
20	Milk
21	Food and
22	Air
23	To demonstrate sterility testing of intravenous fluid with positive and negative controls
24	Demonstration of serotyping and bacteriocin typing
25	Demonstration of lyophilization and other

3.Text book of Microbiology by Prescott

4.Medical Laboratory Technology by Mukherjee

5.Practical Medical Microbiology by Mackie and McCartney

Name of The Course	Applied Haematology - I -- (Practical)			
Course Code	BMLS4052			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	4	2

Course Objectives

1. Apply knowledge in estimating different components of blood.

Course Outcomes

On completion of course student will be able to:

CO1	Differentiate different methods of Hb estimation and perform cell counts
CO2	Estimate ESR and interpret its significance
CO3	Demonstrate bleeding disorder

Suggested Reading

1.Text book of Microbiology by Ananthanarayan

2.Medical Microbiology by Panikar&SatishGupte

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	Hb Estimation Sahli's method Cyanmethaemoglobin method Oxyhaemoglobin method
2	Total leukocyte count
3	Platelets count
3	Absolute Eosinophil count
4	Preparation of smear and staining with Giemsa and Leishman stain.
5	ESR(Wintrobe and Westergren method)
6	Packed cell volume (Macro&Micro)
7	Cytological examination of CSF and other body fluids
8	Physical and Microscopic examination of seminal fluid including sperm count
9	Perform normal DLC

10	Preparation of M/40 Calcium chloride Brain thromboplastin and standardization Cephalin Adsorbed plasma
11	Perform BT, CT, Hess test, PT and APTT
12	Hb Estimation: Sahli's method, Cyanmethaemoglobin method Oxyhaemoglobin method

Suggested Reading

1.Text book of Medical Laboratory Technology by Praful B. Godkar

2.Medical laboratory Technology by K.L. Mukherjee Volume-I

3.PracticalHaematology by J.B. Dacie

4.Atlas of Haematology (5th edition) by G.A. McDonald

5.Clinical Diagnosis &Management by Laboratory methods (20th edition) by John Bernard Henry

Name of The Course	Analytical Clinical Biochemistry – Practical
Course Code	BMLS4053
Prerequisite	
Co-requisite	
Anti-requisite	

	L	T	P	C
	-	-	4	2

Course Objectives

1. Apply knowledge in instruments/techniques used in analytical biochemistry

Course Outcomes

On completion of course student will be able to:

CO1	Demonstrate and perform principle, procedure and working of spectrophotometer and photometer.
CO2	Demonstrate and perform principle, procedure and working of chromatography
CO3	Demonstrate and perform principle, procedure and working of electrophoresis.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	To demonstrate the principle, working & maintenance of spectrophotometer.
2	To demonstrate the principle, working & maintenance of colorimeter.

3	To demonstrate the principle, working & maintenance of flame photometer.
4	To demonstrate the principle, procedure of paper chromatography.
5	To demonstrate the principle & procedure of Gas chromatography.
6	To demonstrate the principle & demonstration of TLC.
7	To demonstrate the principle & procedure of column chromatography.
8	To demonstrate the principle & procedure of Electrophoresis.

Suggested Reading

1. Instrumental Analysis by Chatwal Anand
2. Practical Clinical Biochemistry by Harold Varley
3. Text book of Medical Biochemistry by Chatterjee, Shinde

Name of The Course	Applied Histopathology - I – (Practical)
Course Code	BMLS4054
Prerequisite	
Co-requisite	
Anti-requisite	

	L	T	P	C
	-	-	4	2

Course Objectives**1. Apply knowledge in histopathology technique****Course Outcomes**

On completion of course student will be able to:

CO1	Demonstrate tissue processing
CO2	Demonstrate section cutting
CO3	Demonstrate tissue staining

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	Demonstration of instruments used for dissection
2	Use of antiseptics, disinfectants and insecticides in a tissue culture processing laboratory
3	Reception and labelling of histological specimens

4	Preparation of various fixatives
5	Testing of melting point of paraffin wax and perform embedding of given tissue in paraffin block
6	To process a bone for decalcification
7	To prepare ascending and descending grades of alcohol from absolute alcohol
8	Processing of tissue by manual and automated processor method
9	To demonstrate various part and types of microtome
10	To learn sharpening of microtome knife (Honing and stropping technique), and types of disposable blades in use (High and Low Profile).
11	To perform section cutting (Rough and Fine)
12	To practice attachment of tissue sections to glass slides
13	To learn using tissue floatation bath and drying of sections in oven (60-65C)
14	To perform & practice the Haematoxylin and Eosin staining technique
15	To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH)
16	To learn mounting of stained smears

Suggested Reading

1. Handbook of Histopathological Techniques by C F A Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by F J Baker and Silverton
4. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

Name of The Course	Medical Mycology and Virology – practical			
Course Code	BMLS4055			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	-	-	2	1

Course Objectives

1. Apply practical knowledge in Medical Mycology and Virology laboratory
2. To learn culture media preparation and diagnosis methods for identification of pathogenic fungi.
3. To develop the brief knowledge on diagnosis methods for identification of virus.

Course Outcomes

On completion of course student will be able to:

CO1	Perform Identification of fungi by culture, staining methods
CO2	Explain and perform sample collection for fungal examination
CO3	Perform and identify virus by culture, staining methods

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

List of Experiments	
1	To prepare culture media used routinely in mycology
2	To perform KOH preparation
3	Gram stain
4	Potassium Hydroxide - Calcofluor White method
5	India Ink preparation
6	Modified Kinyoun Acid Fast Stain for Nocardia
7	LCB preparation
8	To identify given yeast culture by performing various identification techniques studied in theory.

9	To identify given mould culture by performing various identification techniques studied in theory.
10	To demonstrate dimorphism in fungi
	To collect and process clinical samples for laboratory diagnosis of fungal infections i.e.
11	Skin
12	Nail
13	Hair
14	Body fluids and secretions
15	To demonstrate structure of viruses and their multiplication from charts etc.
16	To perform Giemsa stain, Seller's stain, immunofluorescent staining procedures for diagnosis of viral infections
17	Demonstration of fertilized hen egg
18	Demonstration of various inoculation routes in fertilized hen egg

3. Medical laboratory Technology vol. I, II, III by Mukherjee

4. Text book of Microbiology by CP Bhavaja

5. Medical Mycology by Dr. JagdishChander

Suggested Reading

1. Text book of Microbiology by Ananthanarayan

2. Medical Microbiology by Panikar & SatishGupte

Name of The Course	Immunology & Bacterial serology			
Course Code	BMLS5001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives:

- To Apply knowledge and Explain Antigens, Antibodies & Antigen-Antibody reactions**
- To perform Antibody reactions, Serological tests and complement system**

Course Outcomes:

On completion of course student will be able to:

CO1	Illustrate History and introduction to immunology & concept of Immunity
CO2	Explain Antigens, Antibodies & Antigen-Antibody reactions
CO3	Demonstrate Antibody reactions, Serological tests and complement system
CO4	Apply their knowledge on understanding Immune response & Basic concepts of autoimmunity and brief knowledge about autoimmune diseases

CO5	Classify Autoimmunity, Automation & Vaccines
CO6	Discuss on recent advancements in rapid diagnosis of viral infections.

Text Book (s)

1. Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanarayanan
3. Medical Microbiology by Paniker&SatishGupte

Reference Book (s)

1. Medical laboratory Technology Vol. I ,II, III by Mukherjee
2. Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough
3. Immunology by Riot
4. Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7255149/

Unit-1: History and introduction to immunology & concept of Immunity hours: 12

History and introduction to immunology. Immunity, innate, Acquired immunity, Basic concepts about their mechanisms System in India
Unit-2: Antigens, Antibodies & Antigen-Antibody reactions hours: 12
Definition, types of antigens and determinants of antigenicity. Definition, types, structure and properties of immunoglobulin, Antigen-Antibody reactions Definition, Classification, General features and mechanisms, Applications of various antigen antibody reactions
Unit-3: Antibody reactions, Serological tests and complement system hours: 12
Complement fixation test, Immuno- fluorescence, ELISA, SDS-PAGE & Western blotting ,Widal, VDRL, ASO, CRP, Brucella tube agglutination, Rose-Waaler. Complement system: Definition, Basic concepts about its components & Complement activation pathways
Unit-4: Immune response: hours: 12
Immune response: Introduction, Basic concepts of Humoral and Cellular immune responses, Hypersensitivity: Definition, Types of hypersensitivity reactions
Unit-5: Autoimmunity, Automation & Vaccines hours: 12
Basic concepts of autoimmunity and brief knowledge about autoimmune diseases: Automation in diagnostic serology: Vaccines: Definition, Types, Vaccination

schedule & Brief knowledge about 'Extended programme of immunization' (EPI) in India
Unit-6: Recent diagnosis in immunology and serology hours: 8
All tests of rapid lateral flow immunoassays reliable in diagnosing SARS-CoV-2 infection.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Applied Haematology – II			
Course Code	BMLS5002			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To Apply knowledge in haematology automation and special haematology investigations

2. To gain knowledge on coagulation factors

3. To Build knowledge on Chromosomal studies in haematological disorders

Course Outcomes:

On completion of course student will be able to:

CO1	Outline the automation in haematology
CO2	Apply knowledge in bone marrow examination
CO3	Examine L.E cell
CO4	Determine coagulation factors and its screening
CO5	Explain Chromosomal disorders in haematological
CO6	Discuss the advancements in automation used in haematology.

Text Book (s)

1. Text book of Medical Laboratory Technology by Praful B. Godkar
2. Medical laboratory Technology by K.L. Mukherjee Volume-I
3. Practical Haematology by J.B. Dacie

Reference Book (s)

1. Clinical Diagnosis & Management by Laboratory
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methods (20 th edition) by John Bernard Henry
2. Atlas of Haematology (5 th edition) by G.A. McDonald
3. De Gruchy's Clinical Haematology in Medical Practice
4. Wintrobe's Clinical Haematology– 2013 by John P. Greer, Daniel A. Arber, Bertil E. Glader, Alan F. List
5. Dmitriy V. Tsykunov ; George A. Kolokolnikov ; Andrey V. Samorodov 10.1109/EIConRus49466.2020.9039509.

Unit-1: hours: 8

Safety precautions in Haematology
Basic concepts of automation in Haematology with special reference to: Blood cell counter Coagulometer

Unit-2: hours: 8

Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios)
Processing and staining of trephine biopsy specimens
Red cell anomalies Morphological changes such as variation in size shape & staining character.
Reticulocytes: Definition, different methods to count, Absolute reticulocyte count and IRF (Immature reticulocyte fraction) and significance of reticulocytes.

Unit-3: hours: 8

Lupus Erythematosus (L.E) cell phenomenon.

Definition of L.E. cell. Demonstration of L.E. cell by various methods. Clinical significance. Correction studies for Factor deficiency

Unit-4: **hours: 8**

Quantitative assay of coagulation factors Principle Procedure Screening of inhibitors against coagulation factors APLA .

Unit-5: **hours: 8**

Karyotyping: Chromosomal studies in haematological disorders (PBLC and Bone marrow) Cyto-chemical staining: Principles, method and significance, Biomedical waste management in Haematology laboratory (Other than Radioactive material)

Unit-6: Advancements in Laboratory automation in Haematology
hours: 8

Introduction, Types of automation used in hematology laboratory, Requiem for the STAT Test, Methods for Automation of Leukocyte Microscopy.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Applied Clinical Biochemistry-I
Course Code	BMLS5003
Prerequisite	

Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To gain knowledge on hazards and safety in laboratory
2. To know how organize and maintain laboratory
3. Apply knowledge in various biochemistry tests and application of quality control

Course Outcomes:

On completion of course student will be able to:

CO1	Illustrate Hazards & safety in lab and to know how to maintain quality in Biochemistry laboratory
CO2	Demonstrate how to set up, organize and maintain laboratory
CO3	Demonstrate and perform various biochemical tests.
CO4	Estimate and perform different types of electrolyte.
CO5	Explain and understand the role of radioactive material and perform ELISA.
CO6	Test Hba1C, Carbon dioxide in TB patients and estimate electrolytes in body cavities fluids

Text Book (s)

1. Text book of Medical Laboratory Technology by P.B. Godkar.
2. Medical Laboratory Technology by Mukherjee
3. Text book of Medical Biochemistry by Chatterjee&Shinde.

Reference Book (s)

1. Medical Laboratory Science, Theory & Practical by A. Kolhatkar.
2. Practical Clinical Biochemistry by Harold Varley.

Unit-1: Hazards and safety measures & QC hours: 8
Hazards & safety measures in clinical Biochemistry laboratory, Quality control and quality assurance in a clinical biochemistry laboratory
Unit-2: Lab organizations and records hour: 6
Laboratory organization, management and maintenance of records
Unit-3: Clinical Biochemical Test hours:10
Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for: Glucose, Proteins, Urea, Uric acid, Creatinine, Bilirubin, Lipids.
Unit-4: Electrolytes and other clinical tests hours:10
Principles, procedures for estimation & assessment of the following including errors involved and their corrections: Sodium, Potassium and Chloride, Iodine, Calcium, Phosphorous and Phosphates
Unit-5: Radioactivity & ELISA hours: 10
Instruments for detection of Radioactivity, Applications of Radioisotopes in clinical biochemistry, Enzyme linked immune sorbent assay
Unit- 6 Hours: 8
Estimation of electrolytes in body cavities fluid, Estimation of Carbon dioxide in TB patients, Importance, methods. Estimation of Hb1c test, principle, clinical importance.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Applied Histopathology – II			
Course Code	BMLS5004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	4	0	0	4

Course Objectives:

1. **Apply knowledge in advance techniques used in histopathology**

Course Outcomes:

On completion of course student will be able to:

CO1	Apply knowledge in Cryostat sectioning and perform special stains
CO2	Demonstrate the protein, nucleic acid and minerals
CO3	Demonstrate the carbohydrates, fat and microorganisms
CO4	Explain the histochemistry diagnostic applications and neuropatho technique
CO5	Explain the working principle and its components Processing of museum technique, use of electron microscopy and microtomy technique

CO6	Elaborate the Immunohistochemistry and FISH
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Text Book (s)

1. Handbook of Histopathological Techniques by C F A Culling
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2. Medical Lab technology by Lynch

Reference Book (s)

1. An Introduction to Medical Lab Technology by F J Baker and Silverton

2. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
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Unit-1:	hours: 12
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Cryostat sectioning, its applications in diagnostic histopathology. Special Staining Procedures for detection of Connective tissue elements, Trichrome staining, muscle fibres, elastic, reticulinfibres, collagen fibres etc.

Unit-2:	hours: 12
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Metachromatic staining such as Toluidine blue on frozen sections Principles of metal impregnation techniques. Demonstration and identification of minerals and pigments, removal of Pigments/ artifacts in tissue sections. Demonstration of Proteins & nucleic acids.

Unit-3:	hours: 12
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Demonstration of Carbohydrates, lipids, fat & fat like substances. Demonstration of bacteria and fungi in tissue section. Tissue requiring special treatment i.e. eye ball, bone marrow, and muscle biopsy, under calcified or uncalcified bones, whole brain, and whole lungs including other large organs

Unit-4	hours: 12
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Enzyme histochemistry: Diagnostic applications and the demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases. Vital staining. Neuro-pathological techniques.

Unit-5:	hours:12
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Museum techniques. Electron Microscope: working principle and its components Processing, embedding and ultra-microtomy Micrometry and Morphometry

Unit -6	hours 8
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Introduction to Immunohistochemistry, Application of Immunohistochemistry, Fluorescence in situ hybridization (FISH), positive control and negative control in stain .

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Immunopathology & Molecular Biology
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Course Code	BMLS5005			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Apply their knowledge on understanding basic molecular techniques
2. Apply their knowledge on understanding Handle and perform ELISA, PCR etc.

Course Outcomes:

On completion of course student will be able to:

CO1	List basics of Immunology
CO2	Outline Transplant Immunology
CO3	Apply knowledge on Autoimmunity, Hypersensitivity & Concept of Immune tolerance
CO4	Make use and apply knowledge in Molecular Biology Techniques
CO5	Examine Chemical composition of DNA
CO6	Elaborate the new advance technique in Immunology

Text Book (s)

1. Immunology by Ivan Roitt, Jonathaan Brostoff and David Male
2. Immunology by Kuby
3. Medical Immunology by Daniel P Stites

Reference Book (s)

1. Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites
2. Elements of Biotechnology by PK Gupta
3. Watson Molecular Biology of Gene

Unit-1: Introduction to Immunolog	hours: 8
Cells of the immune system, Types and Mechanisms of immune response, Lymphoid organs of the Immune system.	
Unit-2: Transplant Immunology	hours: 8
MHC I & II, HLA Typing & Cross matching	
Unit-3: Autoimmunity, Hypersensitivity & Concept of Immune tolerance	hours: 8
Hypersensitivity: Definition, Types, Mechanisms, Autoimmunity & Immune tolerance : Basic concepts	

Unit-4: Introduction to Molecular Biology
hours: 8

Molecular Biology Techniques : Principle, Reagents used, procedure and applications in Medical diagnostics. Polymerase Chain Reaction and its advanced versions Gel electrophoresis Western blotting.

Unit-5: Chemical composition of DNA hours: 8

DNA replication, DNA damage and repair, Regulation of prokaryotic and eukaryotic gene expression & Cell Cycle

Unit 6 hour 8

B cell ELISpot assay, Microfluidic single-cell technology, next-generation sequencing (NGS)

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Immunology and Bacterial Serology – Practical
Course Code	BMLS5051

Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

- Apply knowledge & Perform various serological tests
- Outline the principles and perform various serological tests

Course Outcomes:

At the end of the course student will be able to,

CO1	Show Collection of blood sample by vein puncture, separation and preservation of serum
CO2	Organization and Preparation of various types of buffer of different pH and Molarity
CO3	Apply their knowledge & Perform various serological tests

Text Book (s)

- Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
- Text book of Microbiology by Ananthanarayanan
- Medical Microbiology by Paniker & SatishGupte

Reference Book (s)

- **Medical laboratory Technology Vol. I ,II, III by Mukherjee**
- **Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough**
- **Immunology by Riot**

List of Practical

1	Collection of blood sample by vein puncture, separation and preservation of serum
2	Performing Haemolysin titration for Rose-Waaler test
3	Preparation of Phosphate buffers, Verinol buffer, ASO buffer, Richardson's buffer, Buffers of different pH and Molarity, Tris buffer, Standardization of cell concentration by Spectrophotometer
4	Widal,
5	Brucella Tube Agglutination
6	VDRL (including Antigen Preparation
7	ASO (Anti-Streptolysin O')
8	C-Reactive Protein (Latex agglutination)
9	Rheumatoid factor (RF) Latex agglutination
10	Rose Waaler test
11	Demonstration of antigen/antibody determination by Immuno fluorescence (IF), Immunodiffusion,

precipitation in Agarose gel (Ouchterlony), CCIEP, ELISA, SDS - PAGE and Western blotting.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Applied Haematology -II - (Practical)			
Course Code	BMLS5052			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	4	2

Course Objectives:

- **Apply knowledge in advance technique of Haematology**

Course Outcomes:

At the end of the course student will be able to,

CO1	Demonstrate RBC and WBC morphology and anomalies
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CO2	Demonstrate the coagulation factor
CO3	Demonstrate Advance coagulation study

Text Book (s)

- Text book of Medical Laboratory Technology by Paraful B. Godkar
- Medical laboratory Technology by KL Mukherjee Volume-I
- Practical Haematology by JB Dacie
- Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henary

Reference Book (s)

- Atlas of Haematology (5th edition) by G.A. McDonald
- De Gruchy's clinical Haematology in medical practice

List of Practical

1	Review the morphology of Normal and abnormal RBCs
2	Review the morphology of normal and immature WBCs
3	WBCs anomalies
4	Calculating INR and determining the ISI of thromboplastin
5	Quantitative Factor assays Factor VIII Factor IX Factor VII Factor X Factor V

6	Quantification of inhibitors (Bethesda method)
7	APLA : Lupus Anticoagulant (LA)
8	Anti-cardiolipin antibodies (ACA)
9	Perform Euglobulin clot lysis test (ELT)
10	Urea clot solubility test for factor XIII.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Applied Clinical Biochemistry-I - Practical			
Course Code	BMLS5053			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

- Apply knowledge in principle, procedure, reagent preparation and result interpretation of various clinical biochemistry.

Course Outcomes:

At the end of the course student will be able to,

CO1	Demonstrate and perform various tests for kidney function test.
CO2	Demonstrate and perform various tests for liver function test.
CO3	Demonstrate and perform various tests of lipid profile test.
CO4	Demonstrate and perform electrolytes.

Text Book (s)

- Text book of Medical Laboratory Technology by P. B. Godker
- Medical laboratory Technology by KL Mukherjee Volume-III
- Text book of Medical Biochemistry by Chatterjee, Shinde

Reference Book (s)

- Practical Clinical Biochemistry by Harold Varley.
- Principal of Biochemistry by M. A. Siddiqi

List of Practical

1	Estimation of Glucose in Urine and in Blood.
2	Estimation of Protein in Urine and Blood.

3	Estimation of Urea in blood.
4	Estimation of uric acid in blood.
5	Estimation of serum Bilirubin
6	Estimation of Total Cholesterol in blood.
7	Estimation of HDL Cholesterol.
8	Estimation of LDL Cholesterol.
9	Estimation of TG
10	Estimation of Creatinine in Blood
11	Estimation of serum calcium, Inorganic phosphate

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Applied Histopathology -II – (Practical)
Course Code	BMLS5054
Prerequisite	

Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

- Apply knowledge in advance histopathology technique

Course Outcomes:

At the end of the course student will be able to,

CO1	Demonstrate frozen section
CO2	Demonstrate special stain
CO3	Demonstrate microorganisms and nucleic acid

Text Book (s)

- Handbook of Histopathological Techniques by C F A Culling
- Medical Lab technology by Lynch

Reference Book (s)

- An Introduction to Medical Lab Technology by F J Baker and Silverton
- Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

List of Practical

1	To cut frozen section and stain for Haematoxylin and Eosin, Metachromatic stain Toluidine blue- 'o' and Oil Red 'O' staining for the demonstration of fat
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2	To prepare Schiff's reagent in the lab and do Periodic Acid Schiff's (PAS) stain on a paraffin section
3	To prepare ammonical silver bath in the laboratory and stain paraffin embedded section for the demonstration of reticulin fibers.
4	To stain a paraffin section for the demonstration of smooth muscle by Van Gieson's Stain
5	To perform Masson's trichrome stain on a paraffin section for the demonstration of collagen fiber, muscle fiber and other cell elements.
6	To stain the paraffin section for the demonstration of the elastic fibers (EVG).
7	To stain Decalcified paraffin embedded section for the presence of calcium salts (Von Kossa's method).
8	To stain a paraffin section for the following Mucicarmine, Alcian blue.
9	To stain a paraffin section for the demonstration of iron (Perl's stain)
10	To demonstrate the presence of bacteria and fungi in paraffin embedded sections using the following staining procedures AFB staining (Ziehl-Neelson's staining) for M. tuberculosis and leprae Grocott's stain for fungi Schmorl's reaction for reducing substances (melanin)
11	To stain for nucleic acid (DNA and RNA) Feulgen Staining Methyl Green-Pyronin Staining Enzymatic methods

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Immunopathology & Molecular Biology - (Practical)			
Course Code	BMLS5055			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	0	0	2	1

Course Objectives:

- How to prepare Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation
- Apply knowledge in Electrophoresis

Course Outcomes: At the end of the course student will be able to,

CO1	Apply knowledge on prepare Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation
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CO2	Demonstrate Immunofluorescence: Anti-Nuclear Antibody (ANA), Anti- Neutrophil Cytoplasmic Antibody (ANCA)
CO3	Apply knowledge in Electrophoresis

Text Book (s)

- Immunology by Ivan Roitt, Jonathaan Brostoff and David Male
- Immunology by Kuby
- Medical Immunology by Daniel P Stites
- Basic & Clinical Immunology by P. Daniel Fudenberg, H. Hugh and Stites

Reference Book (s)

- Elements of Biotechnology by PK Gupta
- Watson Molecular Biology of Gene
- Advanced Molecular Biology by R Twyman

List of Practical

1	Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation
2	T and B cell separation
3	Immunofluorescence: Anti- Nuclear Antibody (ANA), Anti- Neutrophil Cytoplasmic Antibody (ANCA)
4	AIDS Immunology and Pathogenesis (AIP)
5	Thyroid Microsomal antigen (TMA)- Agglutination reactions
6	Electrophoresis

7	Gel diffusion
8	Nephelometry
9	HLA: Typing Serology & Cross match, Molecular Typing
10	Nitro blue Tetrazolium Chloride Test (NBT)
11	FACS for CD4 and CD8
12	ELISA for lab. diagnosis of AIDS
13	Polymerase Chain Reaction and its advanced versions
14	Gel electrophoresis
15	Western blotting
16	Isolation of DNA and RNA
17	Estimation of DNA and RNA
18	Determination of molecular weight and quantification of DNA using agarose gel electrophoresis

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

Name of The Course	Medical Parasitology & Entomology			
Course Code	BMLS6001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	4	0	0	4

Course Objectives

1. To learn the basic characteristics and life cycle of parasites.
2. To learn the specimen collection and transportation for parasite.
3. To gain knowledge on diagnosis methods for parasite

Course Outcomes

CO1	Apply knowledge on basic characteristics and classification of parasites
CO2	Demonstrate life cycle of Helminthology/ Helminthic parasites
CO3	Analyse Stool specimen for parasites
CO4	Analyse blood sample for parasite

CO5	Determine specimen collection and transportation for parasite examination
CO6	Discuss on diagnosis of parasite by Electrophoretic Techniques

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-1: Basic Concept of parasites 12 Hours	Introduction to Medical Parasitology with respect to terms used in Parasitology., Protozoology/ Protozoal parasites: General characteristics of protozoa., Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp., Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp., Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp.
Unit-2: Helminthology/ Helminthic parasites 14 Hours	General characteristics of Cestodes, Trematodes and Nematodes., Geographical distribution, Habitat,

Morphology, life cycle, Mode of infection and laboratory diagnosis of : Taeniasolium and saginata, Echinococcusgranulosus, Hymenolepis nana, Schistosomahaematobium and mansoni, Fasciola hepatica and buski, Trichuristrichura, Trichinellaspirales, Strongyloidesstercoralis, Ancylostomaduodenale, Enterobiusvermicularis, Ascarislumbricoides, Wuchereriabancrofti and Dracunculusmedinensis.
Unit-3: Diagnostic procedures (Stool) 10 Hours
Examination of Stool for parasites, For intestinal protozoal infections, General rules for microscopicexamination of stool samples, Collection of stool samples, Preparation of material for unstained and stained preparations, Staining methods i.e. Iodine staining and permanent staining, For Helminthic infections, Introduction, direct smear preparation and examination, Concentration techniques i.e. Flotation and sedimentation techniques and Egg counting techniques
Unit-4: Examination of blood for parasites 12 Hours
Examination of blood for parasites: Preparation of thin and thick blood film, Leishman staining, Examination of thick and thin smear, Field's stain, JSB stain and Examination of blood film for Malarial parasite and Microfilariae
Unit-5: Collection, Transport, processing and

preservation of samples for routine parasitological investigations 12 Hours
Collection, Transport, processing and preservation of samples for routine parasitological investigations; Morphology, life cycle and lab-diagnosis of following parasites Giardia and Entamoeba, Roundworms and Hookworms, T. solium and T. saginata, Malarial parasite with special reference to P.vivax and P. falciparum., Laboratory diagnosis of hydrated cyst and cysticercosis., Concentration techniques for demonstration of Ova and Cysts (Principles and applications)
Unit-6: Advanced techniques for diagnosis of parasite infections 8 Hours
Advanced techniques for diagnosis of parasite infections, Electrophoretic Techniques

1. Medical Parasitology by D.R. Arora
2. Text book of parasitology by CP Bhaveja
3. Medical Entomology by A.K. Hati, Pub. Allied Book Agency
4. Text book of Microbiology by Prescott

Name of The Course	Advanced Haematology
Course Code	BMLS6002
Prerequisite	

Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives

1. To learn the WBC and RBC cells abnormalities and its clinical symptoms.
2. To gain knowledge on Bleeding and platelet abnormalities and diagnosis methods.

Course Outcomes

CO1	Determine examination of Anaemia.
CO2	Explain types of Leukaemia and Chromosomal abnormalities
CO3	Determine bleeding disorders and diagnosis methods
CO4	Examination of Platelet disorders
CO5	Explain Radioisotope techniques used in haematology
CO6	Discuss Single-cell Sequencing in Hematology

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
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10	20	70	100
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Course Content:

Unit-1 Anaemia	8 Hours
Laboratory diagnosis of Iron deficiency anaemia, Laboratory diagnosis of Megaloblastic anaemia & Pernicious anaemia and Classification and Laboratory diagnosis of Haemolytic anaemia	
Unit-2: Leukaemia and Chromosomal studies	8 Hours
Definition, classification and laboratory diagnosis of Leukaemia., Chromosomal studies in various haematological disorders and their significance	
Unit-3: bleeding disorders	8 Hours
Laboratory diagnosis of bleeding disorders with special emphasize to Hemophilia A, B & Von-Willebrand disease and DIC	
Unit-4: Platelet disorder	8 Hours
Platelet disorder (Qualitative and quantitative), Laboratory approach for investigating thrombosis.	
Unit-5: Radioisotopes techniques	8 Hours

Using radioisotopes measurement of: Blood volume, Determination of Red cell volume and Plasma volume, Red cell life span, Platelet life span, Radiation hazards and its prevention and Disposal of radioactive material.

Unit-6:Single-cell Sequencing in Hematology8 Hours:

Hematological malignancies, application of novel single-cell approaches, stem/progenitors cells in myeloid malignancy at single-cell resolution.

	L	T	P	C
	4	0	0	4

Course Objectives

1. To Apply knowledge in various field of biochemistry includes automation, qualitative and quantitative analysis of blood, enzymatic marker testing and rapid techniques in biochemistry

Course Outcomes

CO1	Apply knowledge on different types of automation in biochemistry
CO2	Demonstrate and perform various tolerance tests.
CO3	Performa and understand about qualitative and quantitative tests.
CO4	Estimate and perform different enzymatic test.
CO5	Explain and perform different type's rapid techniques and fluid analysis.
CO6	Perform test on analyzer for thyroid, protein and enzymatic study.

Suggested Reading

1. Text book of Medical Laboratory Technology by Paraful B. Godkar
2. Medical laboratory Technology by KL Mukherjee Volume-I
3. Practical Haematology by JB Dacie
4. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henary
5. Atlas of Haematology (5th edition) by G.A. McDonald
6. De Gruchy's clinical Haematology in medical practice

Name of The Course	Applied Clinical Biochemistry–II
Course Code	BMLS6003
Prerequisite	
Co-requisite	
Anti-requisite	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

		4	0	0	4

Course Objectives

1. To learn the Cryostat sectioning Enzyme Cytochemistry and aspiration cytology
2. To gain knowledge on automation used in cytology and diagnosis of effusion.
3. To learn liquid based cytology

Course Outcomes

CO1	Apply knowledge on importance of cytopathology in diagnosis
CO2	Simplify aspiration cytology techniques
CO3	Determine sex chromatin by staining and explain automation in cytology
CO4	Examination of Exfoliative cytology smear
CO5	Explain diagnosis of Liquid based cytology
CO6	Adapt advanced techniques in Telepathology, Digital cytopathology & in Molecular techniques

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:**Unit-1: Cryostat section 13 Hours**

Cryostat sectioning, its applications in diagnostic cytopathology., EnzymeCytochemistry: Diagnostic applications and Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases.

Unit-2: Aspiration cytology Hours12

Aspiration cytology: Principle, indications & utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics

Unit-3: Automation in cytology 12 Hours

Vital staining for Sex Chromatin and Automation in cytology

Unit-4: Exfoliative cytology12 Hours

Exfoliative cytology (Papanicolaou technique for the staining of cervical smears): Cervical cytology, Fluid Cytology, Urine, CSF and Body Fluids (Pleural, Pericardial, Ascitic)

Unit-5: Liquid based cytology 13 hours

Liquid based cytology: Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry

Unit -6 Advance technique 08 Hour
Telepathology/Telectology (Digital Cytopathology), Molecular Techniques ,Immunocytochemistry, Fish Technique In Cytology

	3	0	0	3

Course Objectives

1.To apply knowledge in basic research and research methodology, biostatistics, methods to be adapted to do research work data analysis and biostatistics

Course Outcomes

CO1	Illustrate the basic principles of research
CO2	Interpret the research findings and application of ethics.
CO3	Apply knowledge on basics of statistical methods and collection of data types.
CO4	Illustrate the basic of biostatistics and research tools
CO5	Analyse research knowledge in presenting biological research
CO6	Modify the research work with use of specific tools.

Suggested Reading

1. Text book of pathology by Harsh mohan
2. Handbook of Histopathological Techniques by C F A Culling
3. Medical Lab technology by Lynch
4. An Introduction to Medical Lab Technology by F J Baker and Silverton
5. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
6. Diagnostic Cytology by Koss Volume –II

Name of The Course	Research methodology and Biostatistics			
Course Code	BMLS6005			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

Unit-1: Basic of research 6 Hours

Introduction to research methods , Identifying research problem	
Unit II:Ethics	6 Hour
Ethical issues in research, Research design	
Unit III: Biostatistics	10 Hours
Basic Concepts of Biostatistics, Types of Data, Research tools and Data collection methods, Need of biostatistics, Understanding of data in biostatistics, How & where to get relevant data, Relation between data & variables, Type of variables: defining data set	
Unit IV: Sampling methods	10 Hours
Sampling methods, Probability rules & Probability distributions (Normal & Binomial) Collection of relevant data: sampling methods Construction of study: population, sample, normality and its beyond (not design of study, perhaps), Summarizing data on the pretext of underlined study, Understanding of statistical analysis (not methods)	
Unit V:Research proposals	8 Hours
Developing a research proposal-Models	

Unit VI Use of advanced research tools 8 Hours
Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

Suggested Reading

1. The Analysis of Biological Data (2nd edition) by Whitlock & Schluter
2. Text Book of Biostatistics and Research methodology by Karthikeyan,R.M .Chaturvedi,R.M.Bhosale3.
3. Textbook of Methods in Biostatistics by B.K.Mahajan 7th Edition
4. Textbook of Biostatistics by B. Annadural

Name of The Course	Medical Parasitology and Entomology			
Course Code	BMLS6051			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. To learn morphological characteristics and life cycle of parasites
2. To develop the brief knowledge on diagnosis of parasites from clinical specimen

Course Outcomes

CO1	Apply practical knowledge on diagnosis of parasites
CO2	Examine stool specimen for parasite by slide methods.
CO3	Demonstration of parasites from blood sample

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1.	Routine stool examination for detection of intestinal parasites with concentration methods:
2.	a)Saline preparation
3.	b)Iodine preparation
4.	c)(Floatation method
5.	d)Centrifugation method
6.	e)Formal ether method

7.	f)Zinc sulphate method
8.	Identification of adult worms from models/slides
9.	a)Tapeworm
10.	b)Tapeworm segments
11.	c)Ascaris (Round worm)
12.	d)Hookworms
13.	e)Pinworms
14.	Malarial parasite:
15.	a)Preparation of thin and thick smears
16.	b)Staining of smears
17.	c)Examination of smears for malarial parasites (P. vivax and P. falciparum

Suggested Reading

1. Medical Parasitology by D.R. Arora
2. Text book of parasitology by CP Bhavaja
3. Medical Entomology by A.K. Hati, Pub. Allied Book Agency
4. Text book of Microbiology by Prescott

Name of The Course	Advanced Haematology - (Practical)			
Course Code	BMLS6052			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. Apply knowledge in Advanced Haematology

Course Outcomes

CO1	Interpret histogram of automated cell counter and screening tests for enzyme deficiency.
CO2	Demonstrate Hb electrophoresis and identification of types of anaemia
CO3	Estimate and perform coagulation studies by advanced technique

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1.	Study and interpretation of Histogram of Automated Blood cell counter
2.	To estimate serum iron and total iron binding capacity.
3.	Screening tests for enzymes deficiency: Pyruvate Kinase, G6PD
4.	To estimate Hb-F, Hb-A2 in a given blood sample.
5.	To estimate plasma and urine Hemoglobin in the given specimens
6.	To demonstrate the presence of Hb-S by Sickling and Solubility tests.
7.	Perform Hb electrophoresis (alkaline)
8.	Perform osmotic red cell fragility.
9.	Detection of Fibrin degradation products (FDPs)
10.	To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.
11.	Estimation of Protein C, S

12.	Peripheral Blood Lymphocyte Culture for chromosome studies in Leukemia
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Suggested Reading

1. Text book of Medical Laboratory Technology by Paraful B. Godkar
2. Medical laboratory Technology by KL Mukherjee Volume-I
3. Practical Haematology by JB Dacie
4. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry
5. Atlas of Haematology (5th edition) by G.A. McDonald
6. De Gruchy's clinical Haematology in medical practice

Name of The Course	Applied Clinical Biochemistry–II - Practical			
Course Code	BMLS6053			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. Apply knowledge in understanding about tolerance; clearance and various enzymatic test perform in clinical biochemistry.

Course Outcomes

CO1	Apply knowledge and perform test glucose and insulin tolerance .
CO2	Demonstrate and perform the various test comes under renal clearance.
CO3	Estimate and perform enzymatic markers and their significance.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1.	Estimation of Glucose tolerance test (GTT).
2.	Estimation of Insulin tolerance test (ITT).
3.	Determination of Uric acid in Urine.
4.	Determination of Creatinine clearance.
5.	Determination of Urea clearance.
6.	Determination of Serum acid phosphatase.

7.	Determination of Serum Alkaline phosphatase.
8.	Determination of Serum Lactate dehydrogenase.
9.	Determination of T3, T4 and TSH

1. To learn the sample processing and smear preparation in cytology lab
2. To gain knowledge on advance techniques used in cytology
3. To perform staining techniques in cytology

Course Outcomes

CO1	Determine and perform all type of stains in cytopathology lab for diagnosis
CO2	Explain frozen sections of Gynae tissue
CO3	Utilize cytospin for diagnosis of body fluids

Suggested Reading

1. Text book of Medical Laboratory Technology by P.B. Godkar.
2. Medical Laboratory Technology by Mukherjee
3. Text book of Medical Biochemistry by Chatterjee&Shinde.
4. Medical Laboratory Science, Theory & Practical by A. Kolhatkar.
5. Practical Clinical Biochemistry by Harold Varley.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1.	To perform Papnicolaou's stain on cervical smear
2.	To perform Guard's staining for demonstration sex chromatin (Barr bodies on a buccal smear
3.	To perform Shorr's staining for Hormonal assessment
4.	To cut frozen sections of Gynaec tissue
5.	To perform CSF sample and body fluids by cytospin

Name of The Course	Cytopathology - (Practical)			
Course Code	BMLS6054			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

6.	Should know the various stains used in Cytopathology lab:MayGrunwaldGiemsa,H&E,PAS, Grocott's.
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CO1	Demonstrate and apply knowledge on uses of biostatistics tools.
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Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
10	20	70	100

Course Content:

1.To practice problems on various biostatistics tools.

Suggested Reading

1. Statistical Methods by S.P. Gupta
2. Methods in biostatistics for medical students by B.K.Mahajan
3. RPG Biostatistics by HimanshuTyagi

Suggested Reading

1. Text book of pathology by Harsh mohan
2. Handbook of Histopathological Techniques by C F A Culling
3. Medical Lab technology by Lynch
4. An Introduction to Medical Lab Technology by F J Baker and Silverton
5. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
6. Diagnostic Cytology by Koss Volume –II

Name of The Course	Research Methodology and Biostatistics – Practical			
Course Code	BMLS6055			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. Apply knowledge resolve of problems with the help of statistics tools.

Course Outcomes