GALGOTIAS UNIVERSITY

(Under the Uttar Pradesh Private Universities Act No. 12 of 2019)

COURSE BOOK

Engineering First Year -2020-2021

Curriculum and syllabus for Engineering First Year

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B.Tech – EE, EEE, ECE, ECE(BM)

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4	BBS01T1002	Semi-conductor Physics	2	0	2	3
5	BBS01T1008	Biology for Engineers*	3	0	0	3
6	BME01T1001	Engineering Graphics & Introduction to Digital Fabrication	1	0	2	2
7	BEE01T1003	Basic Electrical & Electronics Engineering	2	0	2	3
8	BCS01T1002	AI Fundamental	2	0	0	2
9	BCS01T1001	Data Analytics Excel Tableau	0	1	2	2
10	BEE01T1004	Embedded system & IOT	1	0	2	2
11	BBS01T1003	Linear Algebra & Differential Equations	3	0	0	3
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14	BEE01T1006	Electrical Machines	1	0	2	2
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16	BLEUCT1003	Creativity, Innovation & Entrepreneurship	1	0	2	2
17	BLEUCT1002	Creative & Liberal Arts	0	0	2	1
18	BBSUCT1004	(Mandatory Course) Environmental Sciences	2	0	0	0
19	BEE01T1001	Electrical Workshop	1	0	2	2
20	BCS01T1007	Alexa Skilling	0	0	2	0
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B.Tech – CSE (All Programs)

S.No	Course Code	Course Name	L	T	P	C
1	BBS01T1001	Multi Variable Calculus	3	0	2	4
2	BLL01T1003	Communication Skills	2	0	0	2
3	BCS01T1003	Programming for Problem Solving – C	1	0	4	3
4	BME01T1001	Engineering Graphics & Introduction to Digital Fabrication	1	0	2	2
5	BEE01T1003	Basic Electrical & Electronics Engineering	2	0	2	3
6	BCS01T1002	AI Fundamental	2	0	0	2
7	BCS01T1001	Data Analytics Excel Tableau	0	1	2	2
8	BEE01T1004	Embedded system & IOT	1	0	2	2
9	BBS01T1003	Linear Algebra & Differential Equations	3	0	0	3
10	BBS01T1002 /	Semi-conductor Physics	2	0	2	3
11	BBS01T1008	Biology for Engineers*	3	0	0	3
12	BEE01T1005	Introduction to Digital Systems	2	0	2	3
13	BBS01T1006	Discrete Mathematics*	2	0	2	3
14	BCS01T1006	OOPS	1	0	2	2
15	BLEUCT1003	Creativity, Innovation & Entrepreneurship	1	0	2	2
16	BLEUCT1002	Creative & Liberal Arts	0	0	2	1
17	BBSUCT1004	Environmental Sciences	2	0	0	0
18	BCS01T1004 /	Computer Workshop	1	0	2	2
19	BCS01T1007	(Mandatory Course) Alexa Skilling	0	0	2	0
20	BLEUCP1004	YOGA	Non-Credit Course			
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Artificial Intelligence& Data Science

S.No	Course Code	Course Name	L	T	P	C
1	BBS01T1001	Multi Variable Calculus	3	0	2	4
2	BLL01T1003	Communication Skills	2	0	0	2
3	BCS01T1003	Programming for Problem Solving – C	1	0	4	3
4	BME01T1001	Engineering Graphics & Introduction to Digital Fabrication	1	0	2	2
5	BEE01T1005	Introduction to Digital Systems	2	0	2	3
6	BCS01T1002	AI Fundamental	2	0	0	2
7	BCS01T1001	Data Analytics Excel Tableau	0	1	2	2
8	BEE01T1004	Embedded system & IOT	1	0	2	2
9	BBS01T1003	Linear Algebra & Differential Equations	3	0	0	3
10	BBS01T1002	Semi-conductor Physics	2	0	2	3
11	BBS01T1008	Biology for Engineers*	3	0	0	3
12	BCS01T1005	Introduction to Python Programming	2	0	2	3
13	BBS01T1006	Discrete Mathematics*	2	0	2	3
14	BCS01T1008	Introduction to ML	1	0	2	2
15	BLEUCT1003	Creativity, Innovation & Entrepreneurship	1	0	2	2
16	BLEUCT1002	Creative & Liberal Arts	0	0	2	1
17	BBSUCT1004	(Mandatory Course) Environmental Sciences	2	0	0	0
18	BCS01T1004	Computer Workshop	1	0	2	2
19	BCS01T1007	Alexa Skilling	0	0	2	0
20	BLEUCP1004	YOGA	Non-Credit Course			
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B.Tech – Mech, Auto, Civil

S.No	Course Code	Course Name	L	T	P	C
1	BBS01T1001	Multi Variable Calculus	3	0	2	4
2	BLL01T1003	Communication Skills	2	0	0	2
3	BCS01T1003	Programming for Problem Solving – C	1	0	4	3
4	BBS01T1002 /	Semi-conductor Physics	2	0	2	3
5	BBS01T1008	Biology for Engineers	3	0	0	3
6	BME01T1001	Engineering Graphics & Introduction to Digital Fabrication	1	0	2	2
7	BEE01T1003	Basic Electrical & Electronics Engineering	2	0	2	3
8	BCS01T1002	AI Fundamental	2	0	0	2
9	BCS01T1001	Data Analytics Excel Tableau	0	1	2	2
10	BEE01T1004	Embedded system & IOT	1	0	2	2
11	BBS01T1003	Linear Algebra & Differential Equations	3	0	0	3
12	BEE01T1005	Introduction to Digital Systems	2	0	2	3
13	BCS01T1005	Introduction to Python Programming	2	0	2	3
14	BME01T1003 / BCE01T3201	Digital Drawing (For ME) Engineering Mechanics (For CE)	1	0	2	2
15	BLEUCT1003	Creativity, Innovation & Entrepreneurship	1	0	2	2
16	BLEUCT1002	Creative & Liberal Arts	0	0	2	1
17	BBSUCT1004	(Mandatory Course) Environmental Sciences	2	0	0	0
18	BME01T1002	Engineering workshop (Civil & Mechanical)	1	0	2	2
19	BCS01T1007	(Mandatory Course) Alexa Skilling	0	0	2	0
20	BLEUCP1004	YOGA	Non-Credit Course			
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Program: B.Tech
EE, EEE, ECE, ECE(BM)

Scheme:2020-2021

Name of The Course	Multivariable Calculus				
Course Code	BBS01T1001				
Prerequisite	*Single variable calculus.*				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	2	4	

Course Objectives:

In modern world, calculus has become an important tool to describe change and motion and thus it is extensively used in many fields including but not limited to science, engineering, medicine, business, industry.The objective of the course is familiarizing the prospective engineers with techniques in Calculus. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Apply the convergence o f a sequence, series and Fourier series to solve problems in engineering domain. (K1, K2, K3)
CO2	Apply mean value theorems for real-valued functions and use curvature to find evolutes& involutes and test the convergence of the improper integral. (K2, K3,K4)
CO3	Apply the knowledge of multivariable differential calculus to solve various problems. (K2, K3,K4)
CO4	Apply methods to find integrals of multivariable scalar functions and relate it to solve the problems finding areas and volumes. (K2,K3,K4)
CO5	Apply the concepts of Curl, Divergence, Gradient and theorems of Green's , Stoke's and Gauss-divergence to solve various problems in the vector field. (K2,K3, K4)

Text Book (s)

1. *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition,McGraw Hill Education.
2. *George B. Thomas and Ross L. Finney*, **Calculus**, 9th Edition, Pearson Education

Reference Book(s):

1. *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa publishers.
2. *Michael D. Greenberg*, **Advanced Engineering Mathematics**, 2nd Edition, Pearson Education.

Course Content :

Unit-1 Contact Hours:9
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions, Half range Fourier sine and Half range Fourier cosine series.
Unit-2 **Contact Hours: 8**
Evolutes and Involutes, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.

Unit-3	Contact Hours: 8
Functions of several variables, Limits and continuity, Partial derivatives, Total differential, Derivatives of composite and implicit functions, Extreme values and saddle points, Lagrange's method of undetermined multipliers.	
Unit-4	**Contact Hours: 10**
Double integrals in Cartesian and Polar coordinates, Change of order of integration, change of variables (Cartesian to polar), Applications of double integrals to find area and volume,Triple integrals in Cartesian, Applications of triple integral to find volume.	
Unit-5	**Contact Hours: 10**
Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl, line integrals, path independence, potential functions and conservative fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorems (without proof& simple problems).	

Name of The Course	Communication Skills			
Course Code	BCS01T1005			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	2	0	0	2

Course Objectives:

1. *This course helps to providestudentswithan introductiontoprogramming*
2. *It also explains the fundamental concepts of packages and data types*
3. *Introduce the concept of data visualisation using matplotlib and seaborn*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Construct grammatically correct sentences for effective communication.
CO2	Build confidence in public speaking.
CO3	Enhance self-awareness for the purpose of self-improvement.
CO4	Demonstrate effective writing skills for a variety of professional and corporate settings.
CO5	Be creative and integrate essential elements for a better personality**.**

Course Content :

Unit-I
Communication – Definition, Importance, Features- 7Cs and ABCs Basics of Grammar -Noun Pronoun, Subject Verb Agreement, Article, Prepositions, Punctuation Sentence Structure Vocabulary Building -The concept of Word Formation, Synonyms, antonyms, and standard abbreviations. Basic Writing Skills -Brainstorming, Structure, Organisation, Outline, Precision, Coherence (Connectedness) Paragraph writing: Types and Constituents, practice Essay Writing Précis (Selected Essays)

Unit II:
Introduction of self and Goal Setting Extempore Role Play Movie Review Phonetics (Sounds)- Voice Modulation Phonetics (Transcription) Listening Skills Clear Pronunciation Tense Buster Group Discussion Group Presentation by Students
Unit III:
Technical writing style and language Official Communication: Notice, Agenda, Minutes of Meeting, Memo, Official Note, Formal Letters, Brochure, Newsletter, Resume writing

Name of The Course	Programming for Problem Solving-C			
Course Code	BCSE0IT1003			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	1	0	4	3

Course Objectives:

- Provide an overview of computers and problem-solving methods using ‘C’ language
- Serve as a foundation for the study of programming languages.
- Learn to develop program using ‘C’ language.
- To develop the software using the concept of ‘C’ Language.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	The student would learn the basic concepts of Computer and acquire various problem solving techniques such as algorithms and flowchart.
CO2	To understand the basic terminology used in programming and able to write, compile and debug programs in ‘C’ programming language and to develop program logics using decision structures and loop structures.
CO3	To develop program logic using the concept of arrays and arrays of characters.
CO4	To understand the modular techniques such as functions and difference between call by value and call by reference methods.
CO5	Implement and develop small projects using the concept Structures in C programming language.
CO6	Understanding of latest advances and its applications in Computer Programming and Problem Solving.

Text Book (s)

- Alexis Leon and Mathews Leon (2001), Introduction to Information Technology, Tata McGraw-Hill.
- R.G. Dromey (2001), How to Solve it by Computer, Prentice Hall of India.
- Al Kelley and Ira Pohl (1998), A Book on C Programming in C, 4th Edition, Pearson Education.

Reference Book (s):

- E. Balagurusamy7th Edition, Programming ANSI C, McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Prentice-Hall in 1988
- Byron Gottfried, Programming with C, Schaum's Outline

Course Content :

Unit-1 Introduction to Computers and Algorithms	**6 hours**
Parts of a computer, Overview of operating systems, assembler, compilers, interpreters and programming languages, Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart, Algorithm design: Problem solving approach(top down/bottom up approach), Pseudo Code: Representation of different construct, writing pseudo-code from algorithm and flowchart	
Unit-2 Constructs of C	**8 hours**
Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes, Operators and expressions, Types of Statements: Assignment, Control, jumping, Control statements: Decisions(if-else), Loops(while, for, do while), break, continue, case control structure, go to, exit statement	
Unit-3 Arraysand Functions	**8hours**
Array handling in C – declaration – single dimensional arrays, two – dimensional arrays, multi-dimensional arrays, sorting and searching on single- and two-dimensional arrays. Function– declaration - arguments (formal and actual) – return types – types of functions difference between built-in and user-defined functions, Call by Value and call by reference.	
Unit-4 Structures, Union and Pointers	**8 hours**
Structure Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function, unions- difference between structure and union. Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation, passing pointer variables into function.	
Unit-5 String and File Handling	**8 hours**
String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments. Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.	
Unit-6 Advances in C Programming	**7 hours**
The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course.	

Name of The Course	Semiconductor Physics				
Course Code	BBS01T1002				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

This course is designed to provide the knowledge of quantum and band theory for the explanation of semiconductors. The students will also learn about the application of semiconductors in optoelectronic devices. The topics on low dimension /nanomaterial enable the students to think of new applications in semiconductor areas.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the energy band in solids and electron occupation probability
CO2	Understand the physics of semiconductor and develop the ability to choose the appropriate semiconductor for engineering applications
CO3	Apply the knowledge of diode to the development of new and novel optoelectronic devices
CO4	Utilize the knowledge of the low dimensional/ nano materials for engineering applications and understand the basic characterization techniques
CO5	Apply the knowledge of physics to determine the physical quantities/ constants, diode characteristics using experimental set up and analyses the results with maximum accuracy.

Text Book (s)

1. J. Singh , Semiconductor optoelectronics, Physics and Technology, Mc-Graw –Hill Inc. 1995.
2. S.M. Sze, Semiconductor Devices: Physics and Technology, Wiley 2008.
3. Introduction to Nanotechnology C P Poole, Frank J. Owens, John Wiley & Sons, 2011, ISBN 978-81-265-1099-3.
4. B.Sc. Practical Physics by C.L Arora , S. Chand Limited.

Reference Book (s):

1. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.
2. Introduction to Nanoscience and Nanotechnology, KK Chattopadhyay, A N Banerjee, Phi Learning Pvt Ltd., New Delhi, 2012, ISBN-978-81-203-3608-7.
3. Nanotechnology Science Innovation & Opportunity, Lynn E Foster, Pearson publication, 2008, ISBN-9788131711187.
4. Nouredine Zettili, Quantum Mechanics: concepts and applications, 2nd Edition, Wiley, UK, 2009
5. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

Course Content :

Unit 1 Quantum and Band Theory of electron	**6 hrs**
Fermi Dirac distribution function and Fermi level, quantum free electron theory, density of states, Energy band in solids, E-K diagram and Brillouin zone, effective mass, concept of holes.	
Unit 2 Semiconductor	**8 hrs**
Types of semiconductor, Fermi level in semiconductor, effect of carrier concentration and temperature on fermi level, direct-indirect band gap semiconductors, compound semiconductors, Conductivity and mobility, recombination process, Hall effect and applications.	
Unit 3 Applications of Diodes	**8 hrs**
Concept in optical transitions in bulk semiconductors- absorption process, recombination process, explanation for spontaneous emission-stimulated emission-transition rate, theory of p-n junction, p-n junction diode and its I-V characteristics, optoelectronics devices-LEDs, laser diode, Basics of Photovoltaics- photovoltaic effect, Determination of efficiency of PV cell	
Unit- 4 Low Dimension Physics and Nanomaterials	**10 hrs**
Density of states in 0D, 1 D and 2D –Low dimensional systems: Quantum well, Quantum wire, Quantum dots, Nanomaterials and its properties, Classification of Nanomaterials, Carbon nanowires and nanotubes,	

Semiconductor nanomaterials, Graphene, Characterization techniques (basic ideas): Scanning Electron Microscopy and Transmission Scanning Electron microscopy
List of Experiments:
1. Determination of bandgap of semiconductor –Four probe method 2. I-V Characteristics of p-n junction diode 3. Characteristics of Zener diode and voltage regulation 4. Thickness of wire using laser 5. Attenuation and propagation characteristics of optical fiber cable using laser source 6. Study of I V characteristics of Tunnel diode 7. Characteristics of Solar cell and determination of its efficiency. 8. Determination of Planck constant using LED method 9. Study of Hall effect 10. Study of variation of magnetic field using Tangent Galvanometer 11. Study of diffraction grating using mono chromatic and non-monochromatic light sources 12. Characterization of ferroelectric material to study coercivity, retentivity, saturation of magnetic flux and hysteresis loss.

Name of The Course	**Biology for Engineers**			
Course Code	**BEE01T1002**			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

Students will understand about the different dimensions of Bio Systems engineering in the field of healthcare and clinical practices.

Course Outcomes:

After completion of this course work students able to

CO1	Understand about cell, tissue, organ and systems
CO2	Understand functioning of various systems of human body
CO3	Analyse the Measuring & Recording Instruments for recording vital parameters in diagnosis
CO4	Understand and examine the role of Monitoring Instruments in clinical practices
CO5	Demonstrate the capability of the modern imaging systems for diagnostic applications
CO6	Evaluate the applications of Medical devices for Therapy and Prosthetic in biosystems

Text Book (s):

(1) Introduction to Biomedical Engineering by John Enderle, Susan Blanchard and Joseph Bronzino, Academic Press ELSEVIER

(2) Tissue Engineering by Clemens van Blitterswijk (Editor),Peter Thomsen (Editor),Jeffrey Hubbell (Editor),Ranieri Cancedda (Editor),Joost de Bruijn (Editor),Anders Lindahl (Editor),Jerome Sohier (Editor),David F. Williams (Editor), Academic Press

(3) Molecular Cell Biology by Harvey Lodish (Author),David Baltimore (Author),Arnold Berk (Author),W H Freeman & Co (Sd)

(4) Cell Biology & Molecular Biology by N. Arumugam, Saras Publication

Reference Books:

(1) Medical Physics by John R. Cameron and James G. Skofronick, John Wiley & Sons, NY

(2) Handbook of Biomedical Instrumentation by R. S. Khandpur, Tata McGraw- Hill

(3) Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

Course Content:

Unit-1: Cell and Molecular Biology **7 hours**
Cell membrane structure and Intracellular compartments, Macromolecules: Structure, Shape and Information, Introduction to the central Dogmaof information transfer.
Unit 2–: Physiology **13 Lectures**
Digestion- Physiology of digestion, regulation of food intake and digestive secretions. ***Coordination*** - Structure of Brain and Neurons; Physiology of nerve impulse conduction, excitability of membranes, electrical and chemical transmission between cells. ***Cardiovascular System*** - Physiology of blood – compositions & structure, coagulation; Heart: beat, initiation, conduction and regulation; Physiology of Circulation. ***Respiration and Excretion-*** Physiology of respiration; Exchange and transport of gases and its regulation. Physiology of Excretion, Fluid and electrolytes balance, Acid Base balance. Roles of kidney in body water regulation.
Unit-3 Biopotentials **6 hours**
Resting potential, action potentials, synaptic potentials, Exhitatory Post Synaptic Potentials (EPSP) Inhibitory Post synaptic Potentials (IPSP), interaction of signals and Bioelectric signals ECG, EMG, EEG, and its generation and propagation
Unit-4 Patient Recording and Monitoring Instruments **7 hours**
Recording Electrodes, Electrocardiograph, Electroencephalograph, Electromyograph Patient Monitoring Systems, Foetal Monitoring Instruments, Oximeters, Blood Flowmeters, Pulmonary Function Analysers, Blood Gas Analysers, Blood Cell Counters, Audiometers and Hearing Aids,
Unit-5 Modern imaging systems and Advances in Healthcare **6 hours**
X-ray, X-ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System, Ultrasonic Imaging Systems.
Unit-6 Advances in Healthcare **6 hours**
Tissue engineering as therapeutics, electromagnetic therapy, bio ceramics, microrobots and nanobots, Biomaterials, Radiotherapy, Ultrasound Enhanced Nano medicine, and targeted drug delivery, Automated Drug Delivery Systems Artificial skin, limb, advancement in prosthetics, Biocompatibility of artificial organs

Name of The Course	Engineering Graphics and Introduction to Digital Fabrication				
Course Code	BME01T1001				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To establish the usage of basics of engineering graphics in product design.
2. To introduce the concept of product design.
3. To introduce graphics software and apply graphics software for devloping product model.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Sketch orthographic projection of points and lines.
CO2	Draw orthographic projection of two-dimensional planes and surfaces.

CO3	Draw orthographic views from pictorial drawings.
CO4	Develop a solid model using solid works
CO5	Define and demonstrate the use of techniques for processing of CAD models forrapid prototyping

Text Book (s)

1. K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
2. P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.
3. Chee Kai Chua, Kah Fai Leong(2016), 3D Printing And Additive Manufacturing: Principles And Applications, WSPC
4. Ben Redwood, Filemon Schöffer & Brian Garret(2017), The 3D Printing Handbook: Technologies, design and applications, 3D Hubs B.V

Reference Book (s):

1. Course material uploaded on LMS

Course Content :

UNIT I Projection of Points, Lines And Plane Surface **8** hours
Orthographic projection - First angle projection - projection of points and Projection of straight lines inclined to one principal plane –Projection of planes inclined to one principal plane.
Unit II: Projection of Solids **8 hours**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.
Unit III: Conversion of Pictorial drawings into Orthographic views 8 hours
Representation of Three Dimensional objects – Layout of views- Sketching of multiple views from pictorial view of object.
Unit IV: Solid Modeling **8 hours**
Modeling of simple solids in Polyhedra, Regular and Irregular polyhedra, solids of revolution. 3D Modelling on Solidworks– To prepare part model using 2 D drawing and with basic extrusion and revolve commands.
Unit V: Exercises on 3D Printing **8 hours**
Introduction to 3 D printing, Slicing / Pre-processing, Fused deposition modelling technique, design and print 3D models like stepped shaft model and flange coupling model.

Name of The Course	Basic Electrical and Electronics Engineering				
Course Code	BEE01T1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

1. To understand the basic concepts of magnetic circuits, electro magnetism and electrostatics.
2. To understand and analyses AC & DC circuits.
3. To understand the Network Theorem and Semiconductor Devices.
4. To understand basic semiconductor devises
5. To understands sensors and transducers

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand relationship between different electrical parameters.
CO2	Students will develop an ability to analyze DC and AC Circuits of different configurations.
CO3	Understand magnetic aspects of electric current.
CO4	Understand BJT and its characteristics, connections, diode biasing.
CO5	Understand the sensor and transducer.
CO6	Demonstrate the applications of network theorems and semiconductor devices

Reference Book (s):

1. Textbook of Electrical Engineering, B.L. Theraja, Vol. I & II, Twenty, S. Chand & Co 1997 Second.
2. Basic Electrical Engineering, D C.Kulkshreshtha, McGraw,2012 , First.
3.Introduction to Electrical Engineering, Naidu, Kamakshaia, Tata McGraw Hill, 2000, Third
4. Basic Electrical Engineering, H. Cotton, CBC, 2005, Seventh
5.Laboratory courses in Electrical Engg, S G Tarnekar, P K Kharbanda, S B Bodkhe, S D Naik, S. Chand & Co, 2010, Second.
6. Brian R Eggins - Biosensors an Introduction , First edition, John Wiley & Sons Publishers, 1996.
7. Loic J Blum, Pierre R Coulet - Biosensors Principles and Applications, First edition, Marcel Dekker,Inc, 1991.
8. Donald G. Buerk - Biosensors Theory and Applications, First Edition Technomic Publishing. Co, Inc, 1993.

Course Content :

Unit I: D.C. Circuits
Circuits Elements(R, L, C), Kirchhoff's Laws, Superposition Principle and theorem, Norton's theorem, Thevenin's Theorem, Voltage source, (definition, characteristics of practical source, equivalent current source) Star-Delta transformation.
Unit II: Magnetic circuits
Flux, mmf, reluctance, analogous electric circuits, simple calculations for composite magnetic circuits.
Unit III: AC Circuits
Periodic functions, average &rms values, Steady state behaviors with sinusoidal excitation, phasor representation, reactance and impedance, Series and Parallel A.C. circuits, resonance, power in A. C. circuits, power factor.
Unit IV: Bipolar Junction Transistors
Basic diode concept, different types of rectifier circuits, zener diode voltage regulation concept Bipolar junction transistors, CB, CE and CC configurations and characteristics.
Unit V:Transducers and Sensors
Sensor and Transducer Definitions, Criteria to Choose a Sensor, Basic Requirements of a Sensor or Transducer, Classification of Sensors, Analog and Digital Sensors, Biosensors- Advantages and limitations, biosensors for environmental monitoring, biosensors in healthcare applications
Unit VI: Applications
Application of network theorem, Application of Diodes, Application of Bipolar Junction Transistor
List of Experiments (At least 6 Experiments)
• To familiarize with Electrical and Electronics Lab Equipment and basic Electronics Components • To verify (i) Kirchhoff's Current law (ii) Kirchhoff's Voltage law. • To verify Thevinin's theorem. • To verify Norton's theorem. • To verify maximum power transform theorem.

- Observe the given waveform (Sinusoidal/Square/Triangular) and calculate it's Frequency, Peak Value, Average Value, RMS Value and Form factor.
- To plot the V-I Characteristics of P-N Junction Diode and calculate the forward and reverse resistance of the Diode.
- Verification of Regulation action of ZENER Diode.
- To connect the Wave Shaping Circuits (Clipper Circuit) and observe and sketch the Wave form.
- To verify the working of Full Wave Rectifier Circuit (Bridge Rectifier) and calculate it's efficiency.

- To plot the input and output characteristics of a Bipolar Junction Transistor (BJT) in Common Emitter (CE) connection.
- To verify the working of Full Wave Rectifier Circuit (using Centre tapped transformer) and calculate it's efficiency.
- Project – Students should be encouraged to make a working model/Project to demonstrate any Transducer/Sensor action or any related field

Name of The Course	AI Fundamentals				
Course Code	BCS01T1002				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	0	2	

Course Objectives:

- *Provide an overview of Artificial Intelligence and its applications*
- *Develop the ability to understand and apply data analysis on real world data*
- *Provide an overview of Machine Learning*
- *Introduce the cutting edge technologies and the ethical guidelines*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Artificial Intelligence
CO2	Understand the principles of AI and its lifecycle
CO3	Apply the concepts of data analysis in real world scenario
CO4	Identify the characteristics of machine learning that makes it useful to solve real-world problems
CO5	Identify applications of AI in relevant disciplines
CO6	Understand the latest trends in AI and ethical issues

Text Book (s)

1. Norvig, Peter, and Russell, Stuart Jonathan. Artificial intelligence : a modern approach. United Kingdom, Pearson, 2016.

2. Bishop, Christopher M.. Pattern Recognition and Machine Learning. Switzerland, Springer New York, 2016.

Reference Book (s):

- Rich, Elaine. Artificial Intelligence 3E (Sie). India, Tata McGraw-Hill Publ., 2019.
- Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning, MIT Press, 2012
- Linoff, Gordon S. Data analysis using SQL and Excel. John Wiley & Sons, 2015.

Course Content :

Unit-1 Introduction to AI	**4 hours**
Introduction to Artificial Intelligence, Foundations of AI, History of AI, AI Games, Agents and Environment, Risk and Benefits of AI	
Unit-2Principles of AI	**6 hours**
Knowledge Representation, Problem Solving, Searching and its Strategies, Heuristic Search, AI Project Cycle, Problem Scoping, Data Acquisition, Data Exploration, Modeling	
Unit-3 Data Analysis	**6 hours**
Sort, Filter, Conditional Formatting, Charts, Pivot Tables, Tables, What if Analysis, Solver, Descriptive Statistics, Correlation, Regression, Introduction to Programming Languages for AI.	
Unit-4 Introduction to Machine Learning	**5 hours**
Introduction to Machine Learning, Types of Learning, Use of Probability and Statistics in AI, Data Mining and Analysis Techniques	
Unit-5 Applications of AI	**5 hours**
AI applications in Agriculture, Climate, Healthcare, Transport, Automotive Industry, Civil Engineering, Education, Robotics, Finance, Law and Legal practice, Media and Entertainment, Data Security, Tourism	
Unit-6 AI in Practice	**4 hours**
Visualizing Statistical Relationships,Plotting with Categorical Data,Visualizing the Distribution of a Dataset.	

Name of The Course	Data Analytics (Excel and Tableu)				
Course Code	BCS01T1001				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	0	1	

Course Objectives:

1. *This course helps to understand data and usage of data in solving real time problems.*
2. *It also explains the fundamental concepts of big data analytics and data visualization.*
3. *Introduce the concept of Tableau and data analysis.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand data and usage of data in data analytics.
CO2	Apply data analytics techniques for visualization through Excel.
CO3	Visualize trends and discover insights of data analysis using tableau

Text Book (s)

1. Microsoft Excel 2013 Step by Step by Curtis D. Frye; Microsoft Press 2013.
2. Learning Tableau by Joshua N. Milligan,ISBN 139781784391164, PACKT Books - Packt Publishing

Reference Book (s):

1. Excel: Quick Start Guide from Beginner to Expert, by William Fischer

Course Content :

Unit I: Introduction to Data Analytics	**2 hours**
Installing Data Analysis Tool in Excel, sort, Filter, Conditional Formatting, Pivot Table	
Unit 2: Manipulation of Excel Data	**3 hours**
Working with Formula: Data Filtering, Sorting, Use of Range, Functions: SUM(), AVERAGE(), MAX() & MIN(), COUNT() & COUNTA(), IF(), Data Representation using Charts & Graphs, Creation of Pivot table, Create a Chart, Change Chart Type, Switch Row/Column, labels and legends, Print Area	
Unit 3:Exploring Analysis Toolpack	**2 hours**
Histogram, Descriptive Statistics, Moving Average, Exponential, Correlation, Regression	
Unit 4: Introduction to Tableau	**3 hours**
Introduction about Tableau, Installing Tableau Public, Getting Data, visualizing data on maps, tableau worksheets, Scatter plot and graphs, Applying filter, Data highlighters, predictions,	

Name of The Course	Embedded Technology and IoT				
Course Code	BEE01T1004				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

- To provide the awareness of major embedded devices and interfacing devices
- To understand key technologies in Internet of Things.
- To analyze, design or develop parts of an Internet of Things solution for IoT applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2	Recognize and analyze given embedded system design and its performance.
CO3	Identify the programming environment to develop embedded solutions.
CO4	Demonstrate application based competencies in Embedded Programming
CO5	Identify and adopt knowledge of the terminology, requirements and constraints for IoT system development.
CO6	Demonstrate IoT system for smaller applications

Course Content :

UNIT IINTODUCTION TO EMBEDDED SYSTEM

Basic components of Embedded system, Programming Language Classification of Embedded system, Advantage & Disadvantage, Difference between Microprocessor & Microcontroller, Classification based on architecture, Memory Classification, Description of RAM, Description of CPU Registers, Introduction to Embedded C, Difference between C & Embedded C.

UNITII CONTROL STATEMENTS AND FUNCTIONS

Decision making with if statement, If….else statement, Switch statement, GOTO statement, The While and Do – While statements, For statement, Why Functions, Types of Functions, Multi functional program, Return values & their types

UNITIII EMBEDDED SOFTWARE AND HARDWARE INTERFACING

Kiel Compiler, Proteus, Interfacing of LED, Seven segment display, , LCD, Switches, Keyboard, Serial Communication, Sensors.

UNITIV INTRODUCTION TO IoT

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates

List of Experiments (At least SIX experiments needs to be performed)

- Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:- character send and received, Read and display voltage
- Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer
- Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc.
- Experiments using Seven Segment display.
- Experiments using Temperature , IR, Finger print sensors.
- Experiments with Raspberry Pi using LED.
- Experiments on the applications of Buzzer, potentiometer.
- Experiments on Interfacing with Bluetooth devices.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects.
- Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:- character send and received, Read and display voltage .

- Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer.
- Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc.
- Experiments using Seven Segment display.
- Experiments using Temperature , IR, Finger print sensors.
- Experiments with Raspberry Pi using LED.
- Interfacing of the LDR, IR sensors.
- Experiments on the applications of Buzzer, potentiometer.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects

Name of The Course	Linear Algebra and Differential Equations			
Course Code	BBS01T1003			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective:

The objective of the course is familiarizing the prospective engineers with techniques in linear algebra and differential equations. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the courses, students will be able to:

CO1	Apply appropriate method to find inverse of a matrix and to solve system of linear equations. (K2, K3)
CO2	Understand and apply vector space and linear transformation and its matrix representation. (K1,K2, K3)
CO3	Apply the knowledge of eigen value and eigen vector, diagonalization, inner product spaces and orthogonalization for solving various problems.(K2,K3,K4).
CO4	Apply appropriate methods to solve nth order linear ordinary differential equations (K3,K4)
CO5	Classify partial differential equations and apply method of separation of variables to solve PDE.(K3,K4,K5)

Text Books:

1. D. Poole, **Linear Algebra: A Modern Introduction,** 2nd Edition, Brooks/Cole, 2005.
2. *Erwin Kreyszig*,**Advanced Engineering Mathematics,** 10th Edition, John Wiley & Sons.
3. *Peter V. O'Neil,***Advanced Engineering Mathematics,** 7thEdition,Cengage Learning.

Reference Books:

1. *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa Publishers.
2. *Robert T. Smith and Roland B. Minton,***Calculus**, 4thEdition,McGraw Hill Education.
3. *David C Lay,***Linear Algebra and its application,** 3rd Edition, Pearson Education.

Course Content:

Unit-1	Contact Hours:6
Basic Operations on matrices and vectors, Determinants, Cramer Rule, Inverse of matrix using Gauss Jordan elimination, Rank of a matrix, Solution of system of linear equations:Gauss elimination.	
Unit-2	**Contact Hours:10**
Vector Space, Linear Independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank, nullity, rank-nullity theorem, Inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	
Unit-3	**Contact Hours: 9**
Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	
Unit-4	**Contact Hours: 9**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, applications of linear differential equations.	
Unit-5	**Contact Hours: 8**
Basic concepts, Classification of second order linear PDE, Method of separation of variables and its application in solving Wave equation (one dimension), heat equation (one dimension) and Laplace equation (two dimension steady state only).	

Name of The Course	Introduction to Digital Systems			
Course Code	BEE01T1005			
Prerequisite				
Corequisite				
Antirequisite				
L	**T**	**P**	**C**	
2	0	2	3	

Course Objectives:

1. *To familiarize with various Digital IC*
2. *To understand basic fundamentals of Digital circuits..*
3. *To prepare for various engineering applications.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Solve the problems on Number system codes and their conversions.
CO2	Identify Digital IC and implement in the circuits.
CO3	Create, design and simulate canonical logic forms
CO4	Demonstrate the application of combinational and sequential logic circuits

Text Book (s)

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Digital Electronics	R P Jain	McGraw Hill	2017	Second

2	Digital Logic and Computer Design	Morris Mano	PHI	2017 review	Second
3	Digital Electronic Principles-	Malvino	PHI	2011-13	Seventh

Course Content:

Unit-I: Number Systems & Boolean Algebra
Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & non-weighted codes & code conversion, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates. Logic families: TTL, ECL, CMOS.
Unit-II: Combinational Logic:
Switching equations(Mathematical operations), canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, mixed logic combinational circuits, multiple output functions, QuineMcluskey Methods for 5 variables. Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers & De-multiplexer, binary adder, Subtractor, BCD adder, carry look ahead adder, Binary comparator, Arithmetic Logic Units.
Unit-III: Sequential Logic & Circuits:
Latch, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters counter design, Registers, types of registers. Analysis of simple synchronous sequential circuits

List of Experiment
• To study the basic logic gates
  • Verify their truth table.
  • Verification of De Morgan's Theorem.
• Verification Of SOP & POS Given Algebraic Expression Using Universal Gates.
• Designing of HALF and Full adder using basic logic gates.
• Design of 4:1 MULTIPLEXER USING GATES.
• Design and Implementation of 1-bit Magnitude Comparator using basic logic gates.
• Design and Verification of S-R Flip-Flop Circuits.
• Realization of 3-bit synchronous counter design For Various Application.
  • Frequency counters
  • Digital clock
  • Time measurement
• Project based learning: Building of LED Series / Seven Segment LED / Display unit.

Name of The Course	Introduction to Python Programing				
Course Code	BCS01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

1. *This course helps to providestudentswithan introductiontoprogramming*
2. *It also explains the fundamental concepts of packages and data types*
3. *Introduce the concept of data visualisation using matplotlib and seaborn*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Install and run the Python interpreter and understand the basics of python.
CO2	Create and execute Python programs
CO3	Implement functions, tuples and dictionaries.
CO4	Explore packages and implement programs.
CO5	Plot data with matplotlib libraries
CO6	Explore and implement data visualization

Text Book (s)

1.Python Programming using Problem Solving Approach by Reema Thereja, Oxford Publication.
2.Python Programming: An Introduction to Computer Science 2nd Edition by John Zelle

Reference Book (s):

1. Python Programming for the Absolute Beginner, 3rd Edition by Nicheal Dawson

Course Content:

Unit I: Introduction to Python and Computer Programming 8 lecture hours
Installing Python,Introuction to google colab,Data Types, Variables, Basic Input-Output Operations, Basic Operators.
Unit II: Boolean Values, Conditional Execution, Loops, Lists and List 8 lecture hours
Processing, Logical and Bitwise Operations,Making decisions in Python,Python's loops,Logic and bit operations in Python,Lists - collections of data, Sorting simple lists - the bubble sort algorithm, Lists - some more details, Lists in advanced applications.
Unit III: Functions, Tuples, Dictionaries, and Data Processing 8 lecture hours
Writing functions in Python,How functions communicate with their environment?,Returning a result from a function, Scopes in Python, Functions, Tuples and dictionaries
Unit IV: Modules, Packages, String and List Methods 8 lecture hours
Using modules,Some useful modules,What is package?Characters and strings Python's nature of strings,String methods
Unit V: Data Visualization using matplotlib 8 lecture hours
Data Visualization,Introduction to Matplotlib,Line Plot,Bar Chart,Histogram Plot,Box and Whisker Plot,Scatter Plot
Unit-VI : Data Visualization using Seaborn **8 lecture hours**
Visualizing Statistical Relationships,Plotting with Categorical Data,Visualizing the Distribution of a Dataset.

Name of The Course	Electrical Machines				
Course Code	BEE01T1006				
Prerequisite	Physics				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To identify the students with commonly used Symbols, abbreviations, materials & tools used in electrical engineering.
2. Analysis of different types of Wiring and other accessories
3. To familiarize the students with commonly usage of measuring equipment
4. To train the students basic repairing process of domestic appliances

Course Outcomes:

CO1: Understand Concepts of energy transfer through magnetic coupling.
CO2: Understand working principle of transformer.
CO3: Understand Concepts of D.C machines.
CO4: Understand Operation of A.C machines.

Reference Book (s):

1. Basic Electrical Engineering, D C. Kulkshreshtha, McGraw, 2012, First
2.Textbook of Electrical Engineering, B. L. Theraja, Vol. I & II, Twenty, S. Chand & Co., 1997, Second.
3.Introduction to Electrical Engineering, Naidu, Kamakshaia, Tata McGraw Hill, 2000 , Third
4. Basic Electrical Engineering, H. Cotton , CBS, 2005, Seventh.
5.Laboratory courses in Electrical Engg. S. Chand &Co , 2010 ,Second.
6. Electric Machines, Kothari,Nagrath, Tata McGraw Hill, 2006 , Third Edition.

Course Content:

Unit I: Single Phase Transformers:
Introduction, Basic principle, construction of phasor diagram for transformer under no load condition, Transformer on load, EMF equation Phasor diagrams, Equivalent circuit, Losses, Efficiency, Regulation, Open-circuit & short-circuit test.
Unit II: D. C. Machines:
Introduction, construction, EMF and Torque equation, classification, self-excitation of D.C. shunt generators, EMF, voltage, current relations in generator and motor, Characteristics, starting and speed control of d. c. motors.
Unit III: Introduction to AC Motors:
Three phase Induction motor Construction, and principle of rotating field, synchronous speed, Rotor current, torque and slip, Principle of Single phaseCapacitor Start motor.

Name of The Course	Analog Circuits				
Course Code	BEE01T1007				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

5. To familiarize with various electronic components and understand their properties.
6. To understand basic fundamentals of analog circuits.
7. To prepare for various engineering applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Explain the characteristics of diodes and transistors..
CO2	Design and analyze various rectifier and amplifier circuits
CO3	Extend the functions of OP-AMP and design of OP-AMP based circuits
CO4	Identify the applications of OP – AMP and special function IC's.

Text Book (s)

1. J.V.Wait,L.P.HuelsmanandGAKorn,IntroductiontoOperationalAmplifiertheoryand applications, McGraw Hill,1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill,1988.
3. Robert L. Boylestad, Louis Nashelsky, Electronic Devices & Circuits Theory, Pearson India, 10th edition, Pearson India.

Reference Book (s):

1. P.HorowitzandW.Hill,TheArtofElectronics,2ndedition,CambridgeUniversityPress, 1989.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11Publishing, EditionIV
3. Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rdEdition
4. www.nptel.ac.in

Course Content:

Unit-I: PN Junction Diode:
Review of PN junction diode, Varactor Diode, Tunnel Diodes, LED, LCD.
Unit-II: Applications of Diodes &Linear Circuits:
Rectifier with C Filter, Numerical on Rectifiers, Clippers, Clampers, Limiters, Low pass filter, High pass filter with characteristics
Unit-III: Bipolar Junction Transistor and its Applications:
Transistor Doping, Transistor action, Current Components, BJT configurations: CE, CC, CB characteristics, Base Width Modulation. Punch Through Effect. DC load line, Fixed Bias method. Single stage CE transistor as amplifier, BJT as a switch
Unit-IV: Operational Amplifier and its Applications
OP-AMPdesign:Designofdifferentialamplifierforagivenspecification,Designofgainstages and output stages. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR, Slew Rate, Applications of OP-Amp.
List of Experiments
• To design clipper & clamper circuits by using basic components. • To design low pass filter by using basic components. • To design high pass filter by using basic components • To verify input characteristics and output characteristics of transistor in common base mode, to find

out current gain, voltage gain, power gain.

- To design CE transistor as an attenuator switch
- To design CE transistor as an attenuator/using microcap simulation
- To design fixed bias for transistor
- To design OPAMP based applications

Name of The Course	Creativity, Innovation and Entrepreneurship				
Course Code	BLEUCT1003				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To make students aware of the need of self-earning system.
2. To develop interest in creative business ideas.
3. To make them capable of becoming entrepreneurs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the social and economic problems in strategic way and develop creative design thinking and its approach
CO2	Discover the self-potential and skills to effectuate the idea of solving a problem
CO3	Identify the consumers and market to the idea
CO4	Propose a solution in form of product and evaluate the risks

Reference Book (s):

1. Stay Hungry Stay Foolish, Rashmi Bansal, Westland, 2008.
2. Sahlman, William A. "Some Thoughts on Business Plans." Chap. 9 in *The Entrepreneurial Venture*. 2nd ed. by William A. Sahlman, Howard H. Stevenson, Michael J Roberts, and Amar V. Bhide, 138–176. Harvard Business School Press, 1999.
3. Ronstadt R, Robert R. Entrepreneurship: Text, cases and notes. Dover, MA: Lord Publishing; 1984.
4. Steyaert C, Dey P. 1. The books on social entrepreneurship we edit, critique and imagine. Social Entrepreneurship: An Affirmative Critique. 2018 Mar 30:1.
5. Harrison RT, Leitch CM, editors. Research handbook on entrepreneurship and leadership. Edward Elgar Publishing; 2018 Jan 26.
6. Kuratko DF. Entrepreneurship: Theory, process, and practice. Cengage Learning; 2016 Jan 8.

Course Content:

Unit- 1:	**6 hours**
Problem Discussion and Idea generation, Discussion Strategies, What is Idea Generation? – Definition, Techniques and Success Factors, Innovation management, Tools and techniques for generating ideas, Types of idea challenges**.** Problem Classification: Problem Identification, Classification, Resources, Facilities, Idea of solution, Proof of concept. Design Thinking , Understand Design Thinking as a problem solving process, Describe the principles of Design Thinking, Describe the Design Thinking process **Activity: (i)** Identification of a social problem its classification and existing solution (ii) Applying Design Thinkingto a problem worth solving with design thinking steps	

Unit-2:	**4 hours**
Self Discovery and Effectuation: Effectuation principles, Entrepreneurship Styles, Case studies and success stories to draw the difference. **Activity:** (i) Finding your flow (ii)Entrepreneurship styles quiz (M1 to M5 activity)	
Unit-3:	**6 hours**
Customer and solution: Concept of consumer and customer, Market types, Influence of market types, Activity for the students to identify market types based on product and services. Market segmentation and targeting, Criteria for evaluating market segments. **Activity:** Identify your market type	
Unit-4:	**8 hours**
Value Proposition Lean canvas template, Business model canvas, Value Proposition Canvas, Identifying risky assumptions, Prioritising your risk assumptions, Seeking external advice to calibrate your risks. Validation, Refine unique value proposition, Blue ocean strategy **Activity:** (i) Identify the problem, solution and customer segment of existing companies (ii) Identify what is your customer segment, customer jobs, gains, and pains. (iii) Identify your blue ocean strategy.	

Name of The Course	Creative and Liberal Arts			
Course Code	BLEUCT1002			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

Course aims to prepare open-minded, creatively engaged, and culturally aware people to live and play together. Students must show an interest in the liberal arts either by majoring in an artistic field or the humanities (art, English, film, music, theatre, philosophy, political science, history, etc.) or by simply enjoying and getting involved in the arts. Course is designed to generate an atmosphere for students to express and explore the liberal arts, creativity, and artistic interests or skills.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Foster a respect and appreciation for art as a mutual space for communication.
CO2	Understand and respect other perspectives, and promote others artistic endeavors.

Text Book (s)

- Mark Baskinger, William Bardel (2013), Drawing Ideas: A Hand-Drawn Approach for Better Design, Watson-Guptill publication (ebook).
- Paul Klee, Paul Findlay (1966), On Modern Art, Faber & Faber publication, London
- Writing Essays For Dummies' by Mary Page and Carrie Winstanley
- Stuart Carey (2019), From Clay to Kiln, Book Authority publication
- https://chrisoatley.com/how-to-write-a-comic-book-script/

Additional References

- WHAT IS Modern and Contemporary Art?https://imma.ie/wp-content/uploads/2018/10/whatismodernandcontemporaryartmay2010.pdf
- Poetic Devices (Definitions with Examples) and Rhyme-http://dg099.k12.sd.us/12B/Shared%20Documents/poetry%20devices.pdf
- Reading Film as Complex Text Angela Orr EianGilbert https://www.washoeschools.net/cms/lib/NV01912265/Centricity/Domain/253/Social%20Studies/Reading%20Film%20as%20Complex%20Text.pdf

Name of The Course	Environmental Science				
Course Code	BCEUCT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Demonstrate various methods of water treatment for domestic and industrial purpose.
- Explanation of different types of batteries and its commercial applications
- Demonstration and familiarization of impact of waste on environmental degradation.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand various methods of water treatment for domestic and industrial use
CO2	Differentiate various categories of waste and its disposal techniques
CO3	Identify various batteries and recognize its commercial applications
CO4	Understand different tools of Green Chemistry towards generating a zero waste environment
CO5	Apply the knowledge of environmental pollution and degradation to solve related problems

Text Book (s)

- Text Book of Engineering Chemistry, S. S. Dara, S. Chand & company,2013, 11th Edition
- Engineering Chemistry, Jain &Jain, Dhanpatrai&Dhanpatrai,2015,sixteenth edition
- A Test Book of Environmental Chemistry & Pollution Control, S.S. Dara, S. Chand & Co., 2006, 11th edition
- Environmental Studies, Ranu Gadi, Sunita Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s):

- Environmental Chemistry, B.K. Sharma & H. Kaur, Goel Publishing House,2014, 14th edition.
- Environmental Studies, R. Rajgopalan, Oxford Publication,2016, 3rd edition.
- Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.

E-Book (s) :

- Water purification, Alexandru Grumezescu, First edition.
- Solid waste management by Stephen Burnley, Willey publication,2014
- Air Pollution, S. K. Agarwal, APH Publishing, 2005

Course Content:

Unit-1 Water Technology 6 hours
Purification of Domestic water, Boiler troubles, softening methods of industrial water.
Solid Waste Management and treatment Technology: 4 hours
Introduction to E-Waste, Biomedical waste and Solid waste. Treatment: Collection, segregation, transportation and its disposal techniques
Battery Technology & Sustainable Energy Sources: 4 hours
Introduction to Battery, reversible and irreversible batteries. Examples: Lead-acid battery, Nickel-Cadmium Battery, Lithium ion battery and fuel cell Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas.
Unit-4 Green Chemistry 4 hours
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.
Unit-5 : Environmental Pollution & Current Environmental Issues: 4 hours
Air pollution- Urban air quality standards as per WHO, its sources and controlling methods. Water pollution- water quality index as per WHO, its sources and controlling methods, Climate Change and Global warming: Effects, Acid Rain, Ozone Layer depletion, Photochemical Smog,

Name of The Course	Electrical Workshop				
Course Code	BEE01T1001				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To familiarize with various electrical components and symbols.
2. To understand basic fundamentals of electrical devices.

Course Outcomes:

1. Identify tools, symbols & Safety aspects of electrical systems
2. Explain the various types of wiring and other accessories used in house wiring.
3. Measure current, voltage, power and energy in AC/DC circuit.
4. learn the basic repairing process of domestic appliances

Course Content:

Unit I: Electrical Tools and Wiring:
Study of various electrical tools and symbols, Safety aspects of electrical systems, types of cables/wires and switches, fuses & fuse carriers, MCB and ELCB, two way switches. Household Wiring of power distribution, main switch and energy meter.
Unit II: Measuring Instruments and earthing:
Voltmeter, Ammeter, Wattmeter and Energy meter using in AC and DC supply, Effect of the power factor, Study of electricity bill, uninterruptible power supply, Earthing and grounding, basic repairing process of domestic appliances.
List Of Experiments

1. INTRODUCTION OF TOOLS, ELECTRICAL MATERIALS, SYMBOLS
2. ABBREVIATIONS AND DEVICES
3. TO STUDY HOUSE WIRING I.E, BATTEN, CLEAT, CASING-CAPING AND CONDUIT WIRINGS.
4. TO STUDY STAIR CASE WIRING (TWO WAY SWITCHES)
5. TO STUDY FLUORESCENT TUBE LIGHT.
6. TO STUDY CIRCUIT OF UPS
7. TO STUDY MOVING IRON, MOVING COIL, ELECTRODYNAMIC ETC.
8. TO STUDY FUSES, MCBS AND IMPORTANCE OF EARTHING.
9. TO DESIGN AND FABRICATE SINGLE PHASE TRANSFORMER

Name of The Course	Alexa Skilling			
Course Code	BCS01T1007			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	0	0	2	2

Course Objectives:

1. To introduce the student to the idea of voice assistant devices
2. To provide a foundation to create alexa skills

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Alexa
CO2	Understand Alexa Skill Set
CO3	Design an engaging Voice User Interface
CO4	Setting Up AWS
CO5	Create alexa skills.

Text Book (s)

1. Build your own Alexa skill by Andrew Odewahn, Brian Jepson Publisher(s): O'Reilly Media, Inc.ISBN: 9781491974650
2. Alexa Skills Projects, By Madhur Bhargava, Packt

Reference Book (s):

1. Hands-On Chatbot Development with Alexa Skills and Amazon Lex,Sam Williams ,Packt

Course Content:

Unit 1:Introduction to Alexa
Intro to Alexa , The future of voice-based experiences , Overview of Echo, Alexa.
Unit 2:Alexa Skill Set
Build Alexa Skills, Why you should build Alexa skills, What type of Alexa skills you can create, How an Alexa skill works, The steps to build a skill, The requirements to build a skill.
Unit 3:Design an Engaging Voice User Interface

How users interact with Alexa, Voice design concepts: utterances, intents, slots, interaction model and situational design, Characteristics of a well-designed voice user interface (VUI), Key challenges of voice design.
UNIT4:Setting up AWS
Setting Up Your Alexa Skill in the Developer Portal , Setting Up A Lambda Function Using Amazon Web Services, Connecting Your Voice User Interface To Your Lambda Function.
Unit 5 : Creating alexa skills
Fact Skill,Quiz Skill & Project on Alexa Skill
Unit-6 AI in Practice
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.

(Under the Uttar Pradesh Private Universities Act No. 12 of 2019)

Program: B.Tech – CSE (All Programs)

Scheme: 2020-2021

Name of The Course	Multivariable Calculus				
Course Code	BBS01T1001				
Prerequisite	*Single variable calculus.*				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	2	4	

Course Objectives:

In modern world, calculus has become an important tool to describe change and motion and thus it is extensively used in many fields including but not limited to science, engineering, medicine, business, industry.The objective of the course is familiarizing the prospective engineers with techniques in Calculus. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Apply the convergence o f a sequence, series and Fourier series to solve problems in engineering domain. (K1, K2, K3)
CO2	Apply mean value theorems for real-valued functions and use curvature to find evolutes& involutes and test the convergence of the improper integral. (K2, K3,K4)
CO3	Apply the knowledge of multivariable differential calculus to solve various problems. (K2, K3,K4)
CO4	Apply methods to find integrals of multivariable scalar functions and relate it to solve the problems finding areas and volumes. (K2,K3,K4)
CO5	Apply the concepts of Curl, Divergence, Gradient and theorems of Green's , Stoke's and Gauss-divergence to solve various problems in the vector field. (K2,K3, K4)

Text Books:

3. *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition,McGraw Hill Education.
4. *George B. Thomas and Ross L. Finney*, **Calculus**, 9th Edition, Pearson Education

Reference Books:

3. *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa publishers.
4. *Michael D. Greenberg*, **Advanced Engineering Mathematics**, 2nd Edition, Pearson Education

Course Content:

Unit-1 Contact Hours:9
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions, Half range Fourier sine and Half range Fourier cosine series.
Unit-2 Contact Hours: 8
Evolutes and Involutes, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.
Unit-3 Contact Hours: 8
Functions of several variables, Limits and continuity, Partial derivatives, Total differential, Derivatives of composite and implicit functions, Extreme values and saddle points, Lagrange's method of undetermined multipliers.
Unit-4 Contact Hours: 10

Double integrals in Cartesian and Polar coordinates, Change of order of integration, change of variables (Cartesian to polar), Applications of double integrals to find area and volume,Triple integrals in Cartesian, Applications of triple integral to find volume.
Unit-5 **Contact Hours: 10**
Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl, line integrals, path independence, potential functions and conservative fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorems (without proof& simple problems).

Name of The Course	Communication Skills				
Course Code	BCS01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	2	0	0	2	

Course Objectives:

1. *This course helps to providestudentswithan introductiontoprogramming*
2. *It also explains the fundamental concepts of packages and data types*
3. *Introduce the concept of data visualisation using matplotlib and seaborn*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Construct grammatically correct sentences for effective communication.
CO2	Build confidence in public speaking.
CO3	Enhance self-awareness for the purpose of self-improvement.
CO4	Demonstrate effective writing skills for a variety of professional and corporate settings.
CO5	Be creative and integrate essential elements for a better personality**.**

Course Content:

Unit-I
Communication – Definition, Importance, Features- 7Cs and ABCs Basics of Grammar -Noun Pronoun, Subject Verb Agreement, Article, Prepositions, Punctuation Sentence Structure Vocabulary Building -The concept of Word Formation, Synonyms, antonyms, and standard abbreviations. Basic Writing Skills -Brainstorming, Structure, Organisation, Outline, Precision, Coherence (Connectedness) Paragraph writing: Types and Constituents, practice Essay Writing Précis (Selected Essays)
Unit II:
Introduction of self and Goal Setting Extempore Role Play Movie Review Phonetics (Sounds)- Voice Modulation Phonetics (Transcription)

Listening Skills Clear Pronunciation Tense Buster Group Discussion Group Presentation by Students
Unit III:
Technical writing style and language Official Communication: Notice, Agenda, Minutes of Meeting, Memo, Official Note, Formal Letters, Brochure, Newsletter, Resume writing.

Name of The Course	Programming for Problem Solving-C				
Course Code	BCSE0IT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Provide an overview of computers and problem-solving methods using ‘C’ language
- Serve as a foundation for the study of programming languages.
- Learn to develop program using ‘C’ language.
- To develop the software using the concept of ‘C’ Language.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	The student would learn the basic concepts of Computer and acquire various problem solving techniques such as algorithms and flowchart.
CO2	To understand the basic terminology used in programming and able to write, compile and debug programs in ‘C’ programming language and to develop program logics using decision structures and loop structures.
CO3	To develop program logic using the concept of arrays and arrays of characters.
CO4	To understand the modular techniques such as functions and difference between call by value and call by reference methods.
CO5	Implement and develop small projects using the concept Structures in C programming language.
CO6	Understanding of latest advances and its applications in Computer Programming and Problem Solving.

Text Book (s)

- Alexis Leon and Mathews Leon (2001), Introduction to Information Technology, Tata McGraw-Hill.
- R.G. Dromey (2001), How to Solve it by Computer, Prentice Hall of India.
- Al Kelley and Ira Pohl (1998), A Book on C Programming in C, 4th Edition, Pearson Education.

Reference Book (s):

- E. Balagurusamy7th Edition, Programming ANSI C, McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Prentice-Hall in 1988

- Byron Gottfried, Programming with C, Schaum's Outline

Course Content:

Unit-1 Introduction to Computers and Algorithms	**6 hours**
Parts of a computer, Overview of operating systems, assembler, compilers, interpreters and programming languages, Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart, Algorithm design: Problem solving approach(top down/bottom up approach), Pseudo Code: Representation of different construct, writing pseudo-code from algorithm and flowchart	
Unit-2 Constructs of C	**8 hours**
Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes, Operators and expressions, Types of Statements: Assignment, Control, jumping, Control statements: Decisions(if-else), Loops(while, for, do while), break, continue, case control structure, go to, exit statement	
Unit-3 Arraysand Functions	**8hours**
Array handling in C – declaration – single dimensional arrays, two – dimensional arrays, multi-dimensional arrays, sorting and searching on single- and two-dimensional arrays. Function– declaration - arguments (formal and actual) – return types – types of functions difference between built-in and user-defined functions, Call by Value and call by reference.	
Unit-4 Structures, Union and Pointers	**8 hours**
Structure Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function, unions- difference between structure and union. Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation, passing pointer variables into function.	
Unit-5 String and File Handling	**8 hours**
String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments. Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.	
Unit-6 Advances in C Programming	**7 hours**
The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course.	

Name of The Course	Engineering Graphics and Introduction to Digital Fabrication				
Course Code	BME01T1001				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To establish the usage of basics of engineering graphics in product design.
2. To introduce the concept of product design.

3. To introduce graphics software and apply graphics software for devloping product model.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Sketch orthographic projection of points and lines.
CO2	Draw orthographic projection of two-dimensional planes and surfaces.
CO3	Draw orthographic views from pictorial drawings.
CO4	Develop a solid model using solid works
CO5	Define and demonstrate the use of techniques for processing of CAD models forrapid prototyping

Text Book (s)

- K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
- P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.
- Chee Kai Chua, Kah Fai Leong(2016), 3D Printing And Additive Manufacturing: Principles And Applications, WSPC
- Ben Redwood, Filemon Schöffer & Brian Garret(2017), The 3D Printing Handbook: Technologies, design and applications, 3D Hubs B.V

Reference Book (s):

- Course material uploaded on LMS

Course Content:

UNIT I Projection of Points, Lines And Plane Surface **8** hours
Orthographic projection - First angle projection - projection of points and Projection of straight lines inclined to one principal plane –Projection of planes inclined to one principal plane.
Unit II: Projection of Solids **8 hours**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.
Unit III: Conversion of Pictorial drawings into Orthographic views 8 hours
Representation of Three Dimensional objects – Layout of views- Sketching of multiple views from pictorial view of object.
Unit IV: Solid Modeling **8 hours**
Modeling of simple solids in Polyhedra, Regular and Irregular polyhedra, solids of revolution. 3D Modelling on Solidworks– To prepare part model using 2 D drawing and with basic extrusion and revolve commands.
Unit V: Exercises on 3D Printing **8 hours**
Introduction to 3 D printing, Slicing / Pre-processing, Fused deposition modelling technique, design and print 3D models like stepped shaft model and flange coupling model.

Name of The Course	Basic Electrical and Electronics Engineering				
Course Code	BEE01T1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

1. To understand the basic concepts of magnetic circuits, electro magnetism and electrostatics.

2. To understand and analyses AC & DC circuits.
3. To understand the Network Theorem and Semiconductor Devices.
4. To understand basic semiconductor devises
5. To understands sensors and transducers

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand relationship between different electrical parameters.
CO2	Students will develop an ability to analyze DC and AC Circuits of different configurations.
CO3	Understand magnetic aspects of electric current.
CO4	Understand BJT and its characteristics, connections, diode biasing.
CO5	Understand the sensor and transducer.
CO6	Demonstrate the applications of network theorems and semiconductor devices

Reference Book (s):

1. Textbook of Electrical Engineering, B.L. Theraja, Vol. I & II, Twenty, S. Chand & Co 1997 Second.
2. Basic Electrical Engineering, D C.Kulkshreshtha, McGraw,2012 , First.
3.Introduction to Electrical Engineering, Naidu, Kamakshaia, Tata McGraw Hill, 2000, Third
4. Basic Electrical Engineering, H. Cotton, CBC, 2005, Seventh
5.Laboratory courses in Electrical Engg, S G Tarnekar, P K Kharbanda, S B Bodkhe, S D Naik, S. Chand & Co, 2010, Second.
6. Brian R Eggins - Biosensors an Introduction , First edition, John Wiley & Sons Publishers, 1996.
7. Loic J Blum, Pierre R Coulet - Biosensors Principles and Applications, First edition, Marcel Dekker,Inc, 1991.
8. Donald G. Buerk - Biosensors Theory and Applications, First Edition Technomic Publishing. Co, Inc, 1993.

Course Content:

Unit I: D.C. Circuits
Circuits Elements(R, L, C), Kirchhoff's Laws, Superposition Principle and theorem, Norton's theorem, Thevenin's Theorem, Voltage source, (definition, characteristics of practical source, equivalent current source) Star-Delta transformation.
Unit II: Magnetic circuits
Flux, mmf, reluctance, analogous electric circuits, simple calculations for composite magnetic circuits.
Unit III: AC Circuits
Periodic functions, average &rms values, Steady state behaviors with sinusoidal excitation, phasor representation, reactance and impedance, Series and Parallel A.C. circuits, resonance, power in A. C. circuits, power factor.
Unit IV: Bipolar Junction Transistors
Basic diode concept, different types of rectifier circuits, zener diode voltage regulation concept Bipolar junction transistors, CB, CE and CC configurations and characteristics.
Unit V:Transducers and Sensors
Sensor and Transducer Definitions, Criteria to Choose a Sensor, Basic Requirements of a Sensor or Transducer, Classification of Sensors, Analog and Digital Sensors, Biosensors- Advantages and limitations, biosensors for environmental monitoring, biosensors in healthcare applications
Unit VI: Applications
Application of network theorem, Application of Diodes, Application of Bipolar Junction Transistor
List of Experiments (At least 6 Experiments)
• To familiarize with Electrical and Electronics Lab Equipment and basic Electronics Components

- To verify (i) Kirchhoff's Current law (ii) Kirchhoff's Voltage law.
- To verify Thevinin's theorem.
- To verify Norton's theorem.
- To verify maximum power transform theorem.
- Observe the given waveform (Sinusoidal/Square/Triangular) and calculate it's Frequency, Peak Value, Average Value, RMS Value and Form factor.
- To plot the V-I Characteristics of P-N Junction Diode and calculate the forward and reverse resistance of the Diode.
- Verification of Regulation action of ZENER Diode.
- To connect the Wave Shaping Circuits (Clipper Circuit) and observe and sketch the Wave form.
- To verify the working of Full Wave Rectifier Circuit (Bridge Rectifier) and calculate it's efficiency.

- To plot the input and output characteristics of a Bipolar Junction Transistor (BJT) in Common Emitter (CE) connection.
- To verify the working of Full Wave Rectifier Circuit (using Centre tapped transformer) and calculate it's efficiency.
- Project – Students should be encouraged to make a working model/Project to demonstrate any Transducer/Sensor action or any related field

Name of The Course	AI Fundamentals			
Course Code	BCS01T1002			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	2	0	0	2

Course Objectives:

- *Provide an overview of Artificial Intelligence and its applications*
- *Develop the ability to understand and apply data analysis on real world data*
- *Provide an overview of Machine Learning*
- *Introduce the cutting edge technologies and the ethical guidelines*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Artificial Intelligence
CO2	Understand the principles of AI and its lifecycle
CO3	Apply the concepts of data analysis in real world scenario
CO4	Identify the characteristics of machine learning that makes it useful to solve real-world problems
CO5	Identify applications of AI in relevant disciplines
CO6	Understand the latest trends in AI and ethical issues

Text Book (s)

3. Norvig, Peter, and Russell, Stuart Jonathan. Artificial intelligence : a modern approach. United Kingdom, Pearson, 2016.

4. Bishop, Christopher M.. Pattern Recognition and Machine Learning. Switzerland, Springer New York, 2016.

Reference Book (s):

- Rich, Elaine. Artificial Intelligence 3E (Sie). India, Tata McGraw-Hill Publ., 2019.

- Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning, MIT Press, 2012

- Linoff, Gordon S. Data analysis using SQL and Excel. John Wiley & Sons, 2015.

Course Content:

Unit-1 Introduction to AI	**4 hours**
Introduction to Artificial Intelligence, Foundations of AI, History of AI, AI Games, Agents and Environment, Risk and Benefits of AI	
Unit-2Principles of AI	**6 hours**
Knowledge Representation, Problem Solving, Searching and its Strategies, Heuristic Search, AI Project Cycle, Problem Scoping, Data Acquisition, Data Exploration, Modeling	
Unit-3 Data Analysis	**6 hours**
Sort, Filter, Conditional Formatting, Charts, Pivot Tables, Tables, What if Analysis, Solver, Descriptive Statistics, Correlation, Regression, Introduction to Programming Languages for AI.	
Unit-4 Introduction to Machine Learning	**5 hours**
Introduction to Machine Learning, Types of Learning, Use of Probability and Statistics in AI, Data Mining and Analysis Techniques	
Unit-5 Applications of AI	**5 hours**
AI applications in Agriculture, Climate, Healthcare, Transport, Automotive Industry, Civil Engineering, Education, Robotics, Finance, Law and Legal practice, Media and Entertainment, Data Security, Tourism	
Unit-6 AI in Practice	**4 hours**
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.	

Name of The Course	Data Analytics (Excel and Tableu)				
Course Code	BCS01T1001				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	0	1	

Course Objectives:

1. *This course helps to understand data and usage of data in solving real time problems.*
2. *It also explains the fundamental concepts of big data analytics and data visualization.*
3. *Introduce the concept of Tableau and data analysis.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand data and usage of data in data analytics.
CO2	Apply data analytics techniques for visualization through Excel.
CO3	Visualize trends and discover insights of data analysis using tableau

Text Book (s)

1. Microsoft Excel 2013 Step by Step by Curtis D. Frye; Microsoft Press 2013.
2. Learning Tableau by Joshua N. Milligan,ISBN 139781784391164, PACKT Books - Packt Publishing

Reference Book (s):

1. Excel: Quick Start Guide from Beginner to Expert, by William Fischer

Course Content:

Unit I: Introduction to Data Analytics **2 hours**
Installing Data Analysis Tool in Excel, sort, Filter, Conditional Formatting, Pivot Table
Unit 2: Manipulation of Excel Data **3 hours**
Working with Formula: Data Filtering, Sorting, Use of Range, Functions: SUM(), AVERAGE(), MAX() & MIN(), COUNT() & COUNTA(), IF(), Data Representation using Charts & Graphs, Creation of Pivot table, Create a Chart, Change Chart Type, Switch Row/Column, labels and legends, Print Area
Unit 3:Exploring Analysis Toolpack **2 hours**
Histogram, Descriptive Statistics, Moving Average, Exponential, Correlation, Regression
Unit 4: Introduction to Tableau **3 hours**
Introduction about Tableau, Installing Tableau Public, Getting Data, visualizing data on maps, tableau worksheets, Scatter plot and graphs, Applying filter, Data highlighters, predictions,

Name of The Course	Embedded Technology and IoT				
Course Code	BEE01T1004				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

- To provide the awareness of major embedded devices and interfacing devices
- To understand key technologies in Internet of Things.
- To analyze, design or develop parts of an Internet of Things solution for IoT applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2	Recognize and analyze given embedded system design and its performance.
CO3	Identify the programming environment to develop embedded solutions.
CO4	Demonstrate application based competencies in Embedded Programming
CO5	Identify and adopt knowledge of the terminology, requirements and constraints for IoT system development.
CO6	Demonstrate IoT system for smaller applications

Course Content:

UNIT IINTODUCTION TO EMBEDDED SYSTEM
Basic components of Embedded system, Programming Language Classification of Embedded system, Advantage & Disadvantage, Difference between Microprocessor & Microcontroller, Classification based on architecture, Memory Classification, Description of RAM, Description of CPU Registers, Introduction to Embedded C, Difference between C & Embedded C.
UNITII CONTROL STATEMENTS AND FUNCTIONS
Decision making with if statement, If….else statement, Switch statement, GOTO statement, The While and Do – While statements, For statement, Why Functions, Types of Functions, Multi functional program, Return values & their types
UNITIII EMBEDDED SOFTWARE AND HARDWARE INTERFACING
Kiel Compiler, Proteus, Interfacing of LED, Seven segment display, , LCD, Switches, Keyboard, Serial Communication, Sensors.
UNITIV INTRODUCTION TO IoT
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates
List of Experiments (At least SIX experiments needs to be performed) • Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:-character send and received, Read and display voltage • Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer • Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc. • Experiments using Seven Segment display. • Experiments using Temperature , IR, Finger print sensors. • Experiments with Raspberry Pi using LED.

- Experiments on the applications of Buzzer, potentiometer.
- Experiments on Interfacing with Bluetooth devices.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects.
- Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:-character send and received, Read and display voltage .
- Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer.
- Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc.
- Experiments using Seven Segment display.
- Experiments using Temperature , IR, Finger print sensors.
- Experiments with Raspberry Pi using LED.
- Interfacing of the LDR, IR sensors.
- Experiments on the applications of Buzzer, potentiometer.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects

Name of The Course	Linear Algebra and Differential Equations			
Course Code	BBS01T1003			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective:

The objective of the course is familiarizing the prospective engineers with techniques in linear algebra and differential equations. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the courses, students will be able to:

CO1	Apply appropriate method to find inverse of a matrix and to solve system of linear equations. (K2, K3)
CO2	Understand and apply vector space and linear transformation and its matrix representation. (K1,K2, K3)
CO3	Apply the knowledge of eigen value and eigen vector, diagonalization, inner product spaces and orthogonalization for solving various problems.(K2,K3,K4).
CO4	Apply appropriate methods to solve nth order linear ordinary differential equations (K3,K4)
CO5	Classify partial differential equations and apply method of separation of variables to solve PDE.(K3,K4,K5)

Text Books:

- D. Poole, **Linear Algebra: A Modern Introduction,** 2nd Edition, Brooks/Cole, 2005.
- *Erwin Kreyszig*,**Advanced Engineering Mathematics,** 10th Edition, John Wiley & Sons.
- *Peter V. O'Neil,***Advanced Engineering Mathematics,** 7thEdition,Cengage Learning.

Reference Books:

- *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa Publishers.
- *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition, McGraw Hill Education.
- *David C Lay,* **Linear Algebra and its application,** 3rd Edition, Pearson Education.

Course Content:

Unit-1	**Contact Hours:6**
Basic Operations on matrices and vectors, Determinants, Cramer Rule, Inverse of matrix using Gauss Jordan elimination, Rank of a matrix, Solution of system of linear equations:Gauss elimination.	
Unit-2	**Contact Hours:10**
Vector Space, Linear Independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank, nullity, rank-nullity theorem, Inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	
Unit-3	**Contact Hours: 9**
Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	
Unit-4	**Contact Hours: 9**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, applications of linear differential equations.	
Unit-5	**Contact Hours: 8**
Basic concepts, Classification of second order linear PDE, Method of separation of variables and its application in solving Wave equation (one dimension), heat equation (one dimension) and Laplace equation (two dimension steady state only).	

Name of The Course	Semiconductor Physics			
Course Code	BBS01T1002			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	2	0	2	3

Course Objectives:

This course is designed to provide the knowledge of quantum and band theory for the explanation of semiconductors. The students will also learn about the application of semiconductors in optoelectronic devices. The topics on low dimension /nanomaterial enable the students to think of new applications in semiconductor areas.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the energy band in solids and electron occupation probability
CO2	Understand the physics of semiconductor and develop the ability to choose the appropriate semiconductor for engineering applications
CO3	Apply the knowledge of diode to the development of new and novel optoelectronic devices
CO4	Utilize the knowledge of the low dimensional/ nano materials for engineering applications and understand the basic characterization techniques

CO5	Apply the knowledge of physics to determine the physical quantities/ constants, diode characteristics using experimental set up and analyses the results with maximum accuracy.

Text Book (s)

- J. Singh , Semiconductor optoelectronics, Physics and Technology, Mc-Graw –Hill Inc. 1995.
- S.M. Sze, Semiconductor Devices: Physics and Technology, Wiley 2008.
- Introduction to Nanotechnology C P Poole, Frank J. Owens, John Wiley & Sons, 2011, ISBN 978-81-265-1099-3.
- B.Sc. Practical Physics by C.L Arora , S. Chand Limited.

Reference Book (s):

- B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.
- Introduction to Nanoscience and Nanotechnology, KK Chattopadhyay, A N Banerjee, Phi Learning Pvt Ltd., New Delhi, 2012, ISBN-978-81-203-3608-7.
- Nanotechnology Science Innovation & Opportunity, Lynn E Foster, Pearson publication, 2008, ISBN-9788131711187.
- Nouredine Zettili, Quantum Mechanics: concepts and applications, 2nd Edition, Wiley, UK, 2009
- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

Course Content:

Unit 1 Quantum and Band Theory of electron	**6 hrs**
Fermi Dirac distribution function and Fermi level, quantum free electron theory, density of states, Energy band in solids, E-K diagram and Brillouin zone, effective mass, concept of holes.	
Unit 2 Semiconductor	**8 hrs**
Types of semiconductor, Fermi level in semiconductor, effect of carrier concentration and temperature on fermi level, direct-indirect band gap semiconductors, compound semiconductors, Conductivity and mobility, recombination process, Hall effect and applications.	
Unit 3 Applications of Diodes	**8 hrs**
Concept in optical transitions in bulk semiconductors- absorption process, recombination process, explanation for spontaneous emission-stimulated emission-transition rate, theory of p-n junction, p-n junction diode and its I-V characteristics, optoelectronics devices-LEDs, laser diode, Basics of Photovoltaics- photovoltaic effect, Determination of efficiency of PV cell	
Unit- 4 Low Dimension Physics and Nanomaterials	**10 hrs**
Density of states in 0D, 1 D and 2D –Low dimensional systems: Quantum well, Quantum wire, Quantum dots, Nanomaterials and its properties, Classification of Nanomaterials, Carbon nanowires and nanotubes, Semiconductor nanomaterials, Graphene, Characterization techniques (basic ideas): Scanning Electron Microscopy and Transmission Scanning Electron microscopy	
List of Experiments:	
13. Determination of bandgap of semiconductor –Four probe method 14. I-V Characteristics of p-n junction diode 15. Characteristics of Zener diode and voltage regulation 16. Thickness of wire using laser 17. Attenuation and propagation characteristics of optical fiber cable using laser source 18. Study of I V characteristics of Tunnel diode 19. Characteristics of Solar cell and determination of its efficiency. 20. Determination of Planck constant using LED method 21. Study of Hall effect 22. Study of variation of magnetic field using Tangent Galvanometer 23. Study of diffraction grating using mono chromatic and non-monochromatic light sources 24. Characterization of ferroelectric material to study coercivity, retentivity, saturation of magnetic flux and hysteresis loss.	

Name of The Course	**Biology for Engineers**				
Course Code	**BEE01T1002**				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

Students will understand about the different dimensions of Bio Systems engineering in the field of healthcare and clinical practices.

Course Outcomes:

After completion of this course work students able to

CO1	Understand about cell, tissue, organ and systems
CO2	Understand functioning of various systems of human body
CO3	Analyse the Measuring & Recording Instruments for recording vital parameters in diagnosis
CO4	Understand and examine the role of Monitoring Instruments in clinical practices
CO5	Demonstrate the capability of the modern imaging systems for diagnostic applications
CO6	Evaluate the applications of Medical devices for Therapy and Prosthetic in biosystems

Text Book (s):

- Introduction to Biomedical Engineering by John Enderle, Susan Blanchard and Joseph
  - Bronzino, Academic Press ELSEVIER
- Tissue Engineering by Clemens van Blitterswijk (Editor),Peter Thomsen (Editor),Jeffrey
  - Hubbell (Editor),Ranieri Cancedda (Editor),Joost de Bruijn (Editor),Anders Lindahl
  - (Editor),Jerome Sohier (Editor),David F. Williams (Editor), Academic Press
- Molecular Cell Biology by Harvey Lodish (Author),David Baltimore (Author),Arnold Berk (Author),W H Freeman & Co (Sd)
- Cell Biology & Molecular Biology by N. Arumugam, Saras Publication

Reference Books:

(1) Medical Physics by John R. Cameron and James G. Skofronick, John Wiley & Sons, NY
(2) Handbook of Biomedical Instrumentation by R. S. Khandpur, Tata McGraw- Hill
(3) Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

Course Contents

Unit-1: Cell and Molecular Biology	**7 hours**
Cell membrane structure and Intracellular compartments, Macromolecules: Structure, Shape and Information, Introduction to the central Dogmaof information transfer.	
Unit 2–: Physiology	**13 Lectures**
Digestion- Physiology of digestion, regulation of food intake and digestive secretions. ***Coordination*** - Structure of Brain and Neurons; Physiology of nerve impulse conduction, excitability of membranes, electrical and chemical transmission between cells. ***Cardiovascular System*** - Physiology of blood – compositions & structure, coagulation; Heart: beat, initiation, conduction and regulation; Physiology of Circulation. ***Respiration and Excretion-*** Physiology of respiration; Exchange and transport of gases and its regulation. Physiology of Excretion, Fluid and electrolytes balance, Acid Base balance. Roles of kidney in body water regulation.	

Unit-3 Biopotentials	**6 hours**
Resting potential, action potentials, synaptic potentials, Exhitatory Post Synaptic Potentials (EPSP) Inhibitory Post synaptic Potentials (IPSP), interaction of signals and Bioelectric signals ECG, EMG, EEG, and its generation and propagation	
Unit-4 Patient Recording and Monitoring Instruments	**7 hours**
Recording Electrodes, Electrocardiograph, Electroencephalograph, Electromyograph Patient Monitoring Systems, Foetal Monitoring Instruments, Oximeters, Blood Flowmeters, Pulmonary Function Analysers, Blood Gas Analysers, Blood Cell Counters, Audiometers and Hearing Aids,	
Unit-5 Modern imaging systems and Advances in Healthcare	**6 hours**
X-ray, X-ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System, Ultrasonic Imaging Systems.	
Unit-6 Advances in Healthcare	**6 hours**
Tissue engineering as therapeutics, electromagnetic therapy, bio ceramics, microrobots and nanobots, Biomaterials, Radiotherapy, Ultrasound Enhanced Nano medicine, and targeted drug delivery, Automated Drug Delivery Systems Artificial skin, limb, advancement in prosthetics, Biocompatibility of artificial organs	

Name of The Course	Introduction to Digital Systems				
Course Code	BEE01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

- *To familiarize with various Digital IC*
- *To understand basic fundamentals of Digital circuits..*
- *To prepare for various engineering applications*.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Solve the problems on Number system codes and their conversions.
CO2	Identify Digital IC and implement in the circuits.
CO3	Create, design and simulate canonical logic forms
CO4	Demonstrate the application of combinational and sequential logic circuits

Text Book (s)

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Digital Electronics	R P Jain	McGraw Hill	2017	Second
2	Digital Logic and Computer Design	Morris Mano	PHI	2017 review	Second
3	Digital Electronic Principles-	Malvino	PHI	2011-13	Seventh

Course Content:

Unit-I: Number Systems & Boolean Algebra
Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & non-weighted codes & code conversion, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates. Logic families: TTL, ECL, CMOS.
Unit-II: Combinational Logic:
Switching equations(Mathematical operations), canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, mixed logic combinational circuits, multiple output functions, QuineMcluskey Methods for 5 variables. Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers & De-multiplexer, binary adder, Subtractor, BCD adder, carry look ahead adder, Binary comparator, Arithmetic Logic Units.
Unit-III: Sequential Logic & Circuits:
Latch, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters counter design, Registers, types of registers. Analysis of simple synchronous sequential circuits

List of Experiment
• To study the basic logic gates
  • Verify their truth table.
  • Verification of De Morgan's Theorem.
• Verification Of SOP & POS Given Algebraic Expression Using Universal Gates.
• Designing of HALF and Full adder using basic logic gates.
• Design of 4:1 MULTIPLEXER USING GATES.
• Design and Implementation of 1-bit Magnitude Comparator using basic logic gates.
• Design and Verification of S-R Flip-Flop Circuits.
• Realization of 3-bit synchronous counter design For Various Application.
  • Frequency counters
  • Digital clock
  • Time measurement
• Project based learning: Building of LED Series / Seven Segment LED / Display unit.

Name of The Course	**Discrete Mathematics**			
Course Code	BBS01T1006			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective:

The objective of this course is to familiarize the prospective computer scientists with the techniques of mathematical reasoning, logical thinking, abstract mathematical discrete structures so that they may apply a particular set of mathematical facts in relevant situations.

Course Outcomes:

After successful completion of the courses, students will be able to:\

CO1	Apply rule of inference for connecting and validating logical statements and use proof techniques. (K2, K3)
CO2	Use counting techniques to solve various counting problems. (K2, K3)
CO3	Apply the concepts of sets, relation, functions and mathematical induction. (K2, K3, K4)
CO4	Classify the algebraic structures as Group, Ring, field. (K2, K3, K4)
CO5	Classify the structures of graph and tree and use them to simplify various problems. (K2, K3, K4)

Text Book:

1.*Kenneth H. Rosen*, **Discrete Mathematics and Its Applications**, McGraw-Hill.
2. Susanna S Epp, **Discrete Mathematics with Applications,** 4th edition, Wadsworth Publishing Co. Inc
3. *C L Liu and Mohapatra*, **"Elements of Distcrete Mathematics",** a computer oriented approach, 3rd edition, McGraw Hill.

Reference Books:

1. *J P Trembley, R Manohar,***Discrete Mathematical Structures and it's Application to Computer Science,** TMG Edition, Tata McGraw-Hill.
2. *Norman L Biggs*, **Discrete Mathematics,** 2nd Edition, Oxford University Press.
3. *SemyourLipschutz and Marc Lipson* , **Schaum's Outlines Series.**

Unit-1	**Contact Hours:8**
Syntax, Semantics, Validity and Satisfiability, Basic connectives and Truth Tables, Logical Equivalance, ,the laws of logic, Logical implication, Rules of inference,Normal form(CNF,DNF), Predicate logic, Universal and Existantial quantifiers, skolemization. Proof Techniques:Some terminologies, Proof methods and strategies, Forward proof, Proof by contradiction, Proof by contraposition, Proof of necessity and sufficiency.	
Unit-2	**Contact Hours:6**
Counting Techniques: Basic counting techniques, inclusion and exclusion, pigeon-hole principle, permutation and combination	
Unit-3	**Contact Hours: 12**
Operations and laws of sets**,** Cartesian product, binary relation, partial order relation, Equivalence relation, Functions, Bijective function, inverse and composition of function, size of a set, countable and uncountable set, Cantor's diagonal argument and the power set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The well -Ordering principle, Recursive definition, prime numbers, greatest common divisor, Euclidean algorithm, the fundamental theorem of arithmetic.	
Unit-4	**Contact Hours: 10**
Algebraic structures with one binary operation: Semi Group, Monoid, Groups, Subgroups, Congruence relation and quotient structures, Free and Cyclic Monoid and Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism, Algebraic structures with two binary operation: Ring ,Integral domain and Field.	
Unit-5	**Contact Hours: 6**
Graphs and their properties, degree, connectivity, path cycle, sub graphs, isomorphism, Eulerian and Hamiltonian walks, Graph coloring, coloring maps and planer graphs, coloring vertices and edges, list coloring, perfect graph. Trees: Definitions, properties and examples, rooted trees, trees and sorting, weighted trees and prefix codes, bi-connected components and articulation points, shortest distances.	

Name of The Course	**Object Oriented Programming**			
Course Code	BCS01T1006			
Prerequisite	C Programmimg			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	1	0	2	2

Course Objectives:

The purpose of this course is to provide basic concepts of Object oriented programming with C++. The main goal of the course is to teach the students how to Apply the OOPS concepts in various applications that are appropriate for problems that they might encounter. This course is also to teach constructors, destructors, inheritances, polymorphism, virtual function and control structures. This also provides knowledge of input output stream functions.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand an Object Oriented Programming Features.
CO2	Analyze and Apply the role of constructors &destructors in program design.
CO3	Understand the concept of Exception Handling.
CO4	Apply the concept of inheritances, polymorphism and virtual function for problem solution
CO5	Apply the different input output streams for problem solution.
CO6	Understanding of latest advances and its applications in Computer Programming and Problem Solving.

Text Book (s)

1. Object Oriented Programming with C++ - Rajiv Sahay, Oxford Mastering C++ - Venugopal, McGraw-Hill Education (India)
2. Herbert Schildt, C++ - The Complete Reference, Third Edition -Tata McGraw Hill - 1999.
3. Bruce Eckel, Thinking in C++, Second Edition, Volume One, Pearson Education Asia, 2000.

Reference Book (s):

1. Object Oriented Programming in C++ by Robert LaforeTechmedia Publication.
2. Object Oriented Programming in C++ SauravSahay Oxford University Press.
3. Object Oriented Programming in C++ R Rajaram New Age International Publishers 2nd.
4. OOPS C++ Big C++ Cay Horstmann Wiley Publication.
5. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
6. C++ and Object Oriented Programming – Jana, PHI Learning.

Unit I: Introduction: Basic Terminology	**8 lecture hours**
Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const and volatile functions - static members – Objects – pointers and objects – constant objects – nested classes – local classes.	
Unit II: Constructor & Destructor	**8 lecture hours**
Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor.	
Unit III: Exception Handling	**8 lecture hours**
Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and unexpected functions – Uncaught exception.	
Unit IV: Inheritance	**8 lecture hours**

Inheritance – public, private, and protected derivations – multiple inheritance - virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions – RTTI – typeid – dynamic casting – RTTI and templates – cross casting – down casting
Unit V: I/O STREAMS **8lecture hours**
Streams and formatted I/O – I/O manipulators - file handling – random access – object serialization – namespaces - std namespace – ANSI String Objects – standard template library
Unit-6Advances in C++ Programming **7 hours**
The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course.

Name of The Course	Creativity, Innovation and Entrepreneurship				
Course Code	BLEUCT1003				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To make students aware of the need of self-earning system.
2. To develop interest in creative business ideas.
3. To make them capable of becoming entrepreneurs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the social and economic problems in strategic way and develop creative design thinking and its approach
CO2	Discover the self-potential and skills to effectuate the idea of solving a problem
CO3	Identify the consumers and market to the idea
CO4	Propose a solution in form of product and evaluate the risks

Reference Book (s):

- Stay Hungry Stay Foolish, Rashmi Bansal, Westland, 2008.
- Sahlman, William A. "Some Thoughts on Business Plans." Chap. 9 in *The Entrepreneurial Venture*. 2nd ed. by William A. Sahlman, Howard H. Stevenson, Michael J Roberts, and Amar V. Bhide, 138–176. Harvard Business School Press, 1999.
- Ronstadt R, Robert R. Entrepreneurship: Text, cases and notes. Dover, MA: Lord Publishing; 1984.
- Steyaert C, Dey P. 1. The books on social entrepreneurship we edit, critique and imagine. Social Entrepreneurship: An Affirmative Critique. 2018 Mar 30:1.
- Harrison RT, Leitch CM, editors. Research handbook on entrepreneurship and leadership. Edward Elgar Publishing; 2018 Jan 26.
- Kuratko DF. Entrepreneurship: Theory, process, and practice. Cengage Learning; 2016 Jan 8.

Unit- 1:	**6 hours**
Problem Discussion and Idea generation, Discussion Strategies, What is Idea Generation? – Definition, Techniques and Success Factors, Innovation management, Tools and techniques for generating ideas, Types of idea challenges**.** Problem Classification: Problem Identification, Classification, Resources, Facilities, Idea of solution, Proof of concept. Design Thinking , Understand Design Thinking as a problem solving process, Describe the principles of Design Thinking, Describe the Design Thinking process **Activity: (i)** Identification of a social problem its classification and existing solution (ii) Applying Design Thinkingto a problem worth solving with design thinking steps	
Unit-2:	**4 hours**
Self Discovery and Effectuation: Effectuation principles, Entrepreneurship Styles, Case studies and success stories to draw the difference. **Activity:** (i) Finding your flow (ii)Entrepreneurship styles quiz (M1 to M5 activity)	
Unit-3:	**6 hours**
Customer and solution: Concept of consumer and customer, Market types, Influence of market types, Activity for the students to identify market types based on product and services. Market segmentation and targeting, Criteria for evaluating market segments. **Activity:** Identify your market type	
Unit-4:	**8 hours**
Value Proposition Lean canvas template, Business model canvas, Value Proposition Canvas, Identifying risky assumptions, Prioritising your risk assumptions, Seeking external advice to calibrate your risks. Validation, Refine unique value proposition, Blue ocean strategy **Activity:** (i) Identify the problem, solution and customer segment of existing companies (ii) Identify what is your customer segment, customer jobs, gains, and pains. (iii) Identify your blue ocean strategy.	

Name of The Course	Creative and Liberal Arts				
Course Code	BLEUCT1002				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

Course aims to prepare open-minded, creatively engaged, and culturally aware people to live and play together. Students must show an interest in the liberal arts either by majoring in an artistic field or the humanities (art, English, film, music, theatre, philosophy, political science, history, etc.) or by simply enjoying and getting involved in the arts. Course is designed to generate an atmosphere for students to express and explore the liberal arts, creativity, and artistic interests or skills.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Foster a respect and appreciation for art as a mutual space for communication.
CO2	Understand and respect other perspectives, and promote others artistic endeavors.

Text Book (s)

- Mark Baskinger, William Bardel (2013), Drawing Ideas: A Hand-Drawn Approach for Better Design, Watson-Guptill publication (ebook).
- Paul Klee, Paul Findlay (1966), On Modern Art, Faber & Faber publication, London
- Writing Essays For Dummies' by Mary Page and Carrie Winstanley
- Stuart Carey (2019), From Clay to Kiln, Book Authority publication
- https://chrisoatley.com/how-to-write-a-comic-book-script/

Additional References

- WHAT IS Modern and Contemporary Art?https://imma.ie/wp-content/uploads/2018/10/whatismodernandcontemporaryartmay2010.pdf
- Poetic Devices (Definitions with Examples) and Rhyme-http://dg099.k12.sd.us/12B/Shared%20Documents/poetry%20devices.pdf
- Reading Film as Complex Text Angela Orr EianGilbert https://www.washoeschools.net/cms/lib/NV01912265/Centricity/Domain/253/Social%20Studies/Reading%20Film%20as%20Complex%20Text.pdf

Name of The Course	Environmental Science				
Course Code	BCEUCT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Demonstrate various methods of water treatment for domestic and industrial purpose.
- Explanation of different types of batteries and its commercial applications
- Demonstration and familiarization of impact of waste on environmental degradation.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand various methods of water treatment for domestic and industrial use
CO2	Differentiate various categories of waste and its disposal techniques
CO3	Identify various batteries and recognize its commercial applications
CO4	Understand different tools of Green Chemistry towards generating a zero waste environment
CO5	Apply the knowledge of environmental pollution and degradation to solve related problems

Text Book (s)

- Text Book of Engineering Chemistry, S. S. Dara, S. Chand & company,2013, 11th Edition
- Engineering Chemistry, Jain &Jain, Dhanpatrai&Dhanpatrai,2015,sixteenth edition
- A Test Book of Environmental Chemistry & Pollution Control, S.S. Dara, S. Chand & Co., 2006, 11th edition
- Environmental Studies, Ranu Gadi, Sunita Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s):

- Environmental Chemistry, B.K. Sharma & H. Kaur, Goel Publishing House,2014, 14th edition.
- Environmental Studies, R. Rajgopalan, Oxford Publication,2016, 3rd edition.

- Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.

E-Book (s) :

- Water purification, Alexandru Grumezescu, First edition.
- Solid waste management by Stephen Burnley, Willey publication,2014
- Air Pollution, S. K. Agarwal, APH Publishing, 2005

Course Content:

Unit-1 Water Technology	**6 hours**
Purification of Domestic water, Boiler troubles, softening methods of industrial water.	
Solid Waste Management and treatment Technology:	**4 hours**
Introduction to E-Waste, Biomedical waste and Solid waste. Treatment: Collection, segregation, transportation and its disposal techniques	
Battery Technology & Sustainable Energy Sources:	**4 hours**
Introduction to Battery, reversible and irreversible batteries. Examples: Lead-acid battery, Nickel-Cadmium Battery, Lithium ion battery and fuel cell Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas.	
Unit-4 Green Chemistry	**4 hours**
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.	
Unit-5 : Environmental Pollution & Current Environmental Issues:	**4 hours**
Air pollution- Urban air quality standards as per WHO, its sources and controlling methods. Water pollution- water quality index as per WHO, its sources and controlling methods, Climate Change and Global warming: Effects, Acid Rain, Ozone Layer depletion, Photochemical Smog,	

Name of The Course	**Computer Workshop**			
Course Code	BCS01T1004			
Prerequisite	Nil			
Corequisite	Nil			
Antirequisite	Nil			
	L	**T**	**P**	**C**
	2	0	0	2

Course Objectives:

Students of Computer Engineering have to work with various hardware and software not only during academia but also in company. Thus, students should get familiar with various hardware, software, operating systems and networking.

This course will provide student a much needed knowledge of computer hardware and networking, enabling them to identify and rectify the onboard computer hardware, software and network related problems. With the help of this course the student will be able to understand the hardware specifications that are required to run operating system and various application programs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concept and structure of computer hardwareand networking.
CO2	Identify the existing configuration of the computers and peripherals.
CO3	Upgrading the system as and when required.
CO4	Apply their knowledge about computer peripherals to identify / rectify problems onboard.
CO5	Integrate the PCs into local area network and re-install operating system and various application programs.
CO6	Manage data backup and restore operations on computer and update application software.

Reference Book (s)

1. Hardware Bible by Winn L. Rosch
2. Hardware and Software of Personal Computers by Sanjay K. Bose
3. Fundamentals of Computers by V. Rajaraman
4. Computer Studies - A first course by John Shelley and Roger Hunt
5. Computer Fundamentals, MS Office and Internet & WebTechnology by Dinesh Maidasani
6. Modern Computer Hardware Course by M Lotia, P Nair, P Lotia

Course Content:

Assembly of Computer: 6 Hours
Introduction to hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Working of SMPS. Study of various ports. Steps and precautions to assemble computer.
Assembly of Laptop: 4 Hours
laptop hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Study of various ports. Steps and precautions to assemble laptop.
Computer Network Tools: 4 Hours
Introduction to computer network. Study of various topologies. Preparing the network cable using crimping tools and connectors. Study of various network environments.
Operating System and Software Installations : 6 Hours
Introduction to operating system. Types of operating system (Windows and Linux). Window:-Evolution of operating system. Introduction to software. Types of software (MS office, VLC media player, Win rar), etc. Linux:- Evolution of operating system. Introduction to software. Types of software (open office, web browser, etc.) Case study of Installations step for operating system and application softwares.
Internet : 4 Hours
Introduction and evolution of internet. Study of various internet based services like Email, social network, chat, etc. Introduction to cyber security and cyber laws.
Server : 4 Hours

Introduction to server. Difference between server and normal desktop. Evolution of servers. Study of various servers like Email, data, domain, etc.
List of Experiments: The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency. Following is the list of experiments for guidance. As it is laboratory course list is as per content given above

Name of The Course	Alexa Skilling				
Course Code	BCS01T1007				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	0	0	2	2	

Course Objectives:

- To introduce the student to the idea of voice assistant devices
- To provide a foundation to create alexa skills

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Alexa
CO2	Understand Alexa Skill Set
CO3	Design an engaging Voice User Interface
CO4	Setting Up AWS
CO5	Create alexa skills.

Text Book (s)

- Build your own Alexa skill by Andrew Odewahn, Brian Jepson Publisher(s): O'Reilly Media, Inc.ISBN: 9781491974650
- Alexa Skills Projects, By Madhur Bhargava, Packt

Reference Book (s):

- Hands-On Chatbot Development with Alexa Skills and Amazon Lex,Sam Williams ,Packt

Course Content:

Unit 1:Introduction to Alexa
Intro to Alexa , The future of voice-based experiences , Overview of Echo, Alexa.
Unit 2:Alexa Skill Set
Build Alexa Skills, Why you should build Alexa skills, What type of Alexa skills you can create, How an Alexa skill works, The steps to build a skill, The requirements to build a skill.
Unit 3:Design an Engaging Voice User Interface

How users interact with Alexa, Voice design concepts: utterances, intents, slots, interaction model and situational design, Characteristics of a well-designed voice user interface (VUI), Key challenges of voice design.
UNIT4:Setting up AWS
Setting Up Your Alexa Skill in the Developer Portal , Setting Up A Lambda Function Using Amazon Web Services, Connecting Your Voice User Interface To Your Lambda Function.
Unit 5 : Creating alexa skills
Fact Skill,Quiz Skill & Project on Alexa Skill
Unit-6 AI in Practice
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.

GALGOTIAS UNIVERSITY

(Under the Uttar Pradesh Private Universities Act No. 12 of 2019)

Program: B.Tech
Artificial Intelligence& Data Science

Scheme: 2020-2021

Name of The Course	Multivariable Calculus				
Course Code	BBS01T1001				
Prerequisite	*Single variable calculus.*				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	2	4	

Course Objectives:

In modern world, calculus has become an important tool to describe change and motion and thus it is extensively used in many fields including but not limited to science, engineering, medicine, business, industry.The objective of the course is familiarizing the prospective engineers with techniques in Calculus. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Apply the convergence o f a sequence, series and Fourier series to solve problems in engineering domain. (K1, K2, K3)
CO2	Apply mean value theorems for real-valued functions and use curvature to find evolutes& involutes and test the convergence of the improper integral. (K2, K3,K4)
CO3	Apply the knowledge of multivariable differential calculus to solve various problems. (K2, K3,K4)
CO4	Apply methods to find integrals of multivariable scalar functions and relate it to solve the problems finding areas and volumes. (K2,K3,K4)
CO5	Apply the concepts of Curl, Divergence, Gradient and theorems of Green's , Stoke's and Gauss-divergence to solve various problems in the vector field. (K2,K3, K4)

Text Books:

- *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition,McGraw Hill Education.
- *George B. Thomas and Ross L. Finney*, **Calculus**, 9th Edition, Pearson Education

Reference Books:

- *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa publishers.
- *Michael D. Greenberg*, **Advanced Engineering Mathematics**, 2nd Edition, Pearson Education.

Course Content:

Unit-1 Contact Hours:9
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions, Half range Fourier sine and Half range Fourier cosine series.
Unit-2 Contact Hours: 8
Evolutes and Involutes, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.
Unit-3 Contact Hours: 8

Functions of several variables, Limits and continuity, Partial derivatives, Total differential, Derivatives of composite and implicit functions, Extreme values and saddle points, Lagrange's method of undetermined multipliers.
Unit-4 * **Contact Hours: 10**
Double integrals in Cartesian and Polar coordinates, Change of order of integration, change of variables (Cartesian to polar), Applications of double integrals to find area and volume,Triple integrals in Cartesian, Applications of triple integral to find volume.
Unit-5 **Contact Hours: 10**
Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl, line integrals, path independence, potential functions and conservative fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorems (without proof& simple problems).

Name of The Course	Communication Skills				
Course Code	BCS01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	2	0	0	2	

Course Objectives:

1. *This course helps to providestudentswithan introductiontoprogramming*
2. *It also explains the fundamental concepts of packages and data types*
3. *Introduce the concept of data visualisation using matplotlib and seaborn*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Construct grammatically correct sentences for effective communication.
CO2	Build confidence in public speaking.
CO3	Enhance self-awareness for the purpose of self-improvement.
CO4	Demonstrate effective writing skills for a variety of professional and corporate settings.
CO5	Be creative and integrate essential elements for a better personality**.**

Course Content:

Unit-I
Communication – Definition, Importance, Features- 7Cs and ABCs Basics of Grammar -Noun Pronoun, Subject Verb Agreement, Article, Prepositions, Punctuation Sentence Structure Vocabulary Building -The concept of Word Formation, Synonyms, antonyms, and standard abbreviations. Basic Writing Skills -Brainstorming, Structure, Organisation, Outline, Precision, Coherence (Connectedness) Paragraph writing: Types and Constituents, practice Essay Writing Précis (Selected Essays)
Unit II:

Introduction of self and Goal Setting Extempore Role Play Movie Review Phonetics (Sounds)- Voice Modulation Phonetics (Transcription) Listening Skills Clear Pronunciation Tense Buster Group Discussion Group Presentation by Students
Unit III:
Technical writing style and language Official Communication: Notice, Agenda, Minutes of Meeting, Memo, Official Note, Formal Letters, Brochure, Newsletter, Resume writing

Name of The Course	Programming for Problem Solving-C				
Course Code	BCSE0IT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Provide an overview of computers and problem-solving methods using 'C' language
- Serve as a foundation for the study of programming languages.
- Learn to develop program using 'C' language.
- To develop the software using the concept of 'C' Language.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	The student would learn the basic concepts of Computer and acquire various problem solving techniques such as algorithms and flowchart.
CO2	To understand the basic terminology used in programming and able to write, compile and debug programs in 'C' programming language and to develop program logics using decision structures and loop structures.
CO3	To develop program logic using the concept of arrays and arrays of characters.
CO4	To understand the modular techniques such as functions and difference between call by value and call by reference methods.
CO5	Implement and develop small projects using the concept Structures in C programming language.
CO6	Understanding of latest advances and its applications in Computer Programming and Problem Solving.

Text Book (s)

- Alexis Leon and Mathews Leon (2001), Introduction to Information Technology, Tata McGraw-Hill.
- R.G. Dromey (2001), How to Solve it by Computer, Prentice Hall of India.
- Al Kelley and Ira Pohl (1998), A Book on C Programming in C, 4th Edition, Pearson Education.

Reference Book (s):

- E. Balagurusamy7th Edition, Programming ANSI C, McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Prentice-Hall in 1988
- Byron Gottfried, Programming with C, Schaum's Outline

Course Content:

Unit-1 Introduction to Computers and Algorithms **6 hours**
Parts of a computer, Overview of operating systems, assembler, compilers, interpreters and programming languages, Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart, Algorithm design: Problem solving approach(top down/bottom up approach), Pseudo Code: Representation of different construct, writing pseudo-code from algorithm and flowchart
Unit-2 Constructs of C **8 hours**
Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes, Operators and expressions, Types of Statements: Assignment, Control, jumping, Control statements: Decisions(if-else), Loops(while, for, do while), break, continue, case control structure, go to, exit statement
Unit-3 Arraysand Functions **8hours**
Array handling in C – declaration – single dimensional arrays, two – dimensional arrays, multi-dimensional arrays, sorting and searching on single- and two-dimensional arrays. Function– declaration - arguments (formal and actual) – return types – types of functions difference between built-in and user-defined functions, Call by Value and call by reference.
Unit-4 Structures, Union and Pointers **8 hours**
Structure Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function, unions- difference between structure and union. Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation, passing pointer variables into function.
Unit-5 String and File Handling **8 hours**
String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments. Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.
Unit-6 Advances in C Programming **7 hours**
The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course.

Name of The Course	Engineering Graphics and Introduction to Digital Fabrication				
Course Code	BME01T1001				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To establish the usage of basics of engineering graphics in product design.
2. To introduce the concept of product design.
3. To introduce graphics software and apply graphics software for devloping product model.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Sketch orthographic projection of points and lines.
CO2	Draw orthographic projection of two-dimensional planes and surfaces.
CO3	Draw orthographic views from pictorial drawings.
CO4	Develop a solid model using solid works
CO5	Define and demonstrate the use of techniques for processing of CAD models forrapid prototyping

Text Book (s)

- K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
- P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.
- Chee Kai Chua, Kah Fai Leong(2016), 3D Printing And Additive Manufacturing: Principles And Applications, WSPC
- Ben Redwood, Filemon Schöffer & Brian Garret(2017), The 3D Printing Handbook: Technologies, design and applications, 3D Hubs B.V

Reference Book (s):

- Course material uploaded on LMS

Course Content:

UNIT I Projection of Points, Lines And Plane Surface **8** hours
Orthographic projection - First angle projection - projection of points and Projection of straight lines inclined to one principal plane –Projection of planes inclined to one principal plane.
Unit II: Projection of Solids **8 hours**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.
Unit III: Conversion of Pictorial drawings into Orthographic views 8 hours
Representation of Three Dimensional objects – Layout of views- Sketching of multiple views from pictorial view of object.
Unit IV: Solid Modeling **8 hours**

Modeling of simple solids in Polyhedra, Regular and Irregular polyhedra, solids of revolution. 3D Modelling on Solidworks– To prepare part model using 2 D drawing and with basic extrusion and revolve commands.
Unit V: Exercises on 3D Printing **8 hours**
Introduction to 3 D printing, Slicing / Pre-processing, Fused deposition modelling technique, design and print 3D models like stepped shaft model and flange coupling model.

Name of The Course	Introduction to Digital Systems				
Course Code	BEE01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

- *To familiarize with various Digital IC*
- *To understand basic fundamentals of Digital circuits..*
- *To prepare for various engineering applications.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Solve the problems on Number system codes and their conversions.
CO2	Identify Digital IC and implement in the circuits.
CO3	Create, design and simulate canonical logic forms
CO4	Demonstrate the application of combinational and sequential logic circuits

Text Book (s)

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Digital Electronics	R P Jain	McGraw Hill	2017	Second
2	Digital Logic and Computer Design	Morris Mano	PHI	2017 review	Second
3	Digital Electronic Principles-	Malvino	PHI	2011-13	Seventh

Course Content:

Unit-I: Number Systems & Boolean Algebra
Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & non-weighted codes & code conversion, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates. Logic families: TTL, ECL, CMOS.
Unit-II: Combinational Logic:
Switching equations(Mathematical operations), canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, mixed logic combinational circuits, multiple output functions, QuineMcluskey Methods for 5 variables. Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers & De-multiplexer, binary adder, Subtractor, BCD adder, carry look ahead adder, Binary comparator, Arithmetic Logic Units.

Unit-III: Sequential Logic & Circuits:
Latch, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters counter design, Registers, types of registers. Analysis of simple synchronous sequential circuits

List of Experiment
• To study the basic logic gates
  • Verify their truth table.
  • Verification of De Morgan's Theorem.
• Verification Of SOP & POS Given Algebraic Expression Using Universal Gates.
• Designing of HALF and Full adder using basic logic gates.
• Design of 4:1 MULTIPLEXER USING GATES.
• Design and Implementation of 1-bit Magnitude Comparator using basic logic gates.
• Design and Verification of S-R Flip-Flop Circuits.
• Realization of 3-bit synchronous counter design For Various Application.
  • Frequency counters
  • Digital clock
  • Time measurement
• Project based learning: Building of LED Series / Seven Segment LED / Display unit.

Name of The Course	AI Fundamentals			
Course Code	BCS01T1002			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	2	0	0	2

Course Objectives:

- *Provide an overview of Artificial Intelligence and its applications*
- *Develop the ability to understand and apply data analysis on real world data*
- *Provide an overview of Machine Learning*
- *Introduce the cutting edge technologies and the ethical guidelines*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Artificial Intelligence
CO2	Understand the principles of AI and its lifecycle
CO3	Apply the concepts of data analysis in real world scenario
CO4	Identify the characteristics of machine learning that makes it useful to solve real-world problems
CO5	Identify applications of AI in relevant disciplines
CO6	Understand the latest trends in AI and ethical issues

Text Book (s)

- Norvig, Peter, and Russell, Stuart Jonathan. Artificial intelligence : a modern approach. United Kingdom, Pearson, 2016.

- Bishop, Christopher M.. Pattern Recognition and Machine Learning. Switzerland, Springer New York, 2016.

Reference Book (s):

- Rich, Elaine. Artificial Intelligence 3E (Sie). India, Tata McGraw-Hill Publ., 2019.
- Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning, MIT Press, 2012
- Linoff, Gordon S. Data analysis using SQL and Excel. John Wiley & Sons, 2015.

Course Content:

Unit-1 Introduction to AI	**4 hours**
Introduction to Artificial Intelligence, Foundations of AI, History of AI, AI Games, Agents and Environment, Risk and Benefits of AI	
Unit-2Principles of AI	**6 hours**
Knowledge Representation, Problem Solving, Searching and its Strategies, Heuristic Search, AI Project Cycle, Problem Scoping, Data Acquisition, Data Exploration, Modeling	
Unit-3 Data Analysis	**6 hours**
Sort, Filter, Conditional Formatting, Charts, Pivot Tables, Tables, What if Analysis, Solver, Descriptive Statistics, Correlation, Regression, Introduction to Programming Languages for AI.	
Unit-4 Introduction to Machine Learning	**5 hours**
Introduction to Machine Learning, Types of Learning, Use of Probability and Statistics in AI, Data Mining and Analysis Techniques	
Unit-5 Applications of AI	**5 hours**
AI applications in Agriculture, Climate, Healthcare, Transport, Automotive Industry, Civil Engineering, Education, Robotics, Finance, Law and Legal practice, Media and Entertainment, Data Security, Tourism	
Unit-6 AI in Practice	**4 hours**
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.	

Name of The Course	Data Analytics (Excel and Tableu)				
Course Code	BCS01T1001				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	0	1	

Course Objectives:

1. *This course helps to understand data and usage of data in solving real time problems.*
2. *It also explains the fundamental concepts of big data analytics and data visualization.*
3. *Introduce the concept of Tableau and data analysis.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand data and usage of data in data analytics.
CO2	Apply data analytics techniques for visualization through Excel.
CO3	Visualize trends and discover insights of data analysis using tableau

Text Book (s)

1. Microsoft Excel 2013 Step by Step by Curtis D. Frye; Microsoft Press 2013.
2. Learning Tableau by Joshua N. Milligan,ISBN 139781784391164, PACKT Books - Packt Publishing

Reference Book (s):

1. Excel: Quick Start Guide from Beginner to Expert, by William Fischer

Course Content:

Unit I: Introduction to Data Analytics **2 hours**
Installing Data Analysis Tool in Excel, sort, Filter, Conditional Formatting, Pivot Table
Unit 2: Manipulation of Excel Data **3 hours**
Working with Formula: Data Filtering, Sorting, Use of Range, Functions: SUM(), AVERAGE(), MAX() & MIN(), COUNT() & COUNTA(), IF(), Data Representation using Charts & Graphs, Creation of Pivot table, Create a Chart, Change Chart Type, Switch Row/Column, labels and legends, Print Area
Unit 3:Exploring Analysis Toolpack **2 hours**
Histogram, Descriptive Statistics, Moving Average, Exponential, Correlation, Regression
Unit 4: Introduction to Tableau **3 hours**
Introduction about Tableau, Installing Tableau Public, Getting Data, visualizing data on maps, tableau worksheets, Scatter plot and graphs, Applying filter, Data highlighters, predictions,

Name of The Course	Embedded Technology and IoT				
Course Code	BEE01T1004				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

- To provide the awareness of major embedded devices and interfacing devices
- To understand key technologies in Internet of Things.
- To analyze, design or develop parts of an Internet of Things solution for IoT applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2	Recognize and analyze given embedded system design and its performance.
CO3	Identify the programming environment to develop embedded solutions.
CO4	Demonstrate application based competencies in Embedded Programming
CO5	Identify and adopt knowledge of the terminology, requirements and constraints for IoT system development.
CO6	Demonstrate IoT system for smaller applications

Course Content:

UNIT IINTODUCTION TO EMBEDDED SYSTEM
Basic components of Embedded system, Programming Language Classification of Embedded system, Advantage & Disadvantage, Difference between Microprocessor & Microcontroller, Classification based on architecture, Memory Classification, Description of RAM, Description of CPU Registers, Introduction to Embedded C, Difference between C & Embedded C.
UNITII CONTROL STATEMENTS AND FUNCTIONS
Decision making with if statement, If….else statement, Switch statement, GOTO statement, The While and Do – While statements, For statement, Why Functions, Types of Functions, Multi functional program, Return values & their types
UNITIII EMBEDDED SOFTWARE AND HARDWARE INTERFACING
Kiel Compiler, Proteus, Interfacing of LED, Seven segment display, , LCD, Switches, Keyboard, Serial Communication, Sensors.
UNITIV INTRODUCTION TO IoT
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates
List of Experiments (At least SIX experiments needs to be performed) • Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:-character send and received, Read and display voltage • Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer • Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc. • Experiments using Seven Segment display. • Experiments using Temperature , IR, Finger print sensors.

- Experiments with Raspberry Pi using LED.
- Experiments on the applications of Buzzer, potentiometer.
- Experiments on Interfacing with Bluetooth devices.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects.
- Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:-character send and received, Read and display voltage .
- Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer.
- Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc.
- Experiments using Seven Segment display.
- Experiments using Temperature , IR, Finger print sensors.
- Experiments with Raspberry Pi using LED.
- Interfacing of the LDR, IR sensors.
- Experiments on the applications of Buzzer, potentiometer.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects

Name of The Course	Linear Algebra and Differential Equations			
Course Code	BBS01T1003			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective:

The objective of the course is familiarizing the prospective engineers with techniques in linear algebra and differential equations. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the courses, students will be able to:

CO1	Apply appropriate method to find inverse of a matrix and to solve system of linear equations. (K2, K3)
CO2	Understand and apply vector space and linear transformation and its matrix representation. (K1,K2, K3)
CO3	Apply the knowledge of eigen value and eigen vector, diagonalization, inner product spaces and orthogonalization for solving various problems.(K2,K3,K4).
CO4	Apply appropriate methods to solve nth order linear ordinary differential equations (K3,K4)
CO5	Classify partial differential equations and apply method of separation of variables to solve PDE.(K3,K4,K5)

Text Books:

- D. Poole, **Linear Algebra: A Modern Introduction,** 2nd Edition, Brooks/Cole, 2005.
- *Erwin Kreyszig*,**Advanced Engineering Mathematics,** 10th Edition, John Wiley & Sons.
- *Peter V. O'Neil,***Advanced Engineering Mathematics,** 7thEdition,Cengage Learning.

Reference Books:

- *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa Publishers.
- *Robert T. Smith and Roland B. Minton,* **Calculus**, 4thEdition,McGraw Hill Education.
- *David C Lay,* **Linear Algebra and its application,** 3rd Edition, Pearson Education.

Course Content:

Unit-1	**Contact Hours:6**
Basic Operations on matrices and vectors, Determinants, Cramer Rule, Inverse of matrix using Gauss Jordan elimination, Rank of a matrix, Solution of system of linear equations:Gauss elimination.	
Unit-2	**Contact Hours:10**
Vector Space, Linear Independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank, nullity, rank-nullity theorem, Inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	
Unit-3	**Contact Hours: 9**
Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	
Unit-4	**Contact Hours: 9**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, applications of linear differential equations.	
Unit-5	**Contact Hours: 8**
Basic concepts, Classification of second order linear PDE, Method of separation of variables and its application in solving Wave equation (one dimension), heat equation (one dimension) and Laplace equation (two dimension steady state only).	

Name of The Course	Semiconductor Physics			
Course Code	BBS01T1002			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	2	0	2	3

Course Objectives:

This course is designed to provide the knowledge of quantum and band theory for the explanation of semiconductors. The students will also learn about the application of semiconductors in optoelectronic devices. The topics on low dimension /nanomaterial enable the students to think of new applications in semiconductor areas.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the energy band in solids and electron occupation probability
CO2	Understand the physics of semiconductor and develop the ability to choose the appropriate semiconductor for engineering applications
CO3	Apply the knowledge of diode to the development of new and novel optoelectronic devices
CO4	Utilize the knowledge of the low dimensional/ nano materials for engineering applications and understand the basic characterization techniques
CO5	Apply the knowledge of physics to determine the physical quantities/ constants, diode characteristics using experimental set up and analyses the results with maximum accuracy.

Text Book (s)

1. J. Singh , Semiconductor optoelectronics, Physics and Technology, Mc-Graw –Hill Inc. 1995.
2. S.M. Sze, Semiconductor Devices: Physics and Technology, Wiley 2008.
3. Introduction to Nanotechnology C P Poole, Frank J. Owens, John Wiley & Sons, 2011, ISBN 978-81-265-1099-3.
4. B.Sc. Practical Physics by C.L Arora , S. Chand Limited.

Reference Book (s):

5. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.
6. Introduction to Nanoscience and Nanotechnology, KK Chattopadhyay, A N Banerjee, Phi Learning Pvt Ltd., New Delhi, 2012, ISBN-978-81-203-3608-7.
7. Nanotechnology Science Innovation & Opportunity, Lynn E Foster, Pearson publication, 2008, ISBN-9788131711187.
8. Nouredine Zettili, Quantum Mechanics: concepts and applications, 2nd Edition, Wiley, UK, 2009
9. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

Course Content:

Unit 1 Quantum and Band Theory of electron	**6 hrs**
Fermi Dirac distribution function and Fermi level, quantum free electron theory, density of states, Energy band in solids, E-K diagram and Brillouin zone, effective mass, concept of holes.	
Unit 2 Semiconductor	**8 hrs**
Types of semiconductor, Fermi level in semiconductor, effect of carrier concentration and temperature on fermi level, direct-indirect band gap semiconductors, compound semiconductors, Conductivity and mobility, recombination process, Hall effect and applications.	
Unit 3 Applications of Diodes	**8 hrs**
Concept in optical transitions in bulk semiconductors- absorption process, recombination process, explanation for spontaneous emission-stimulated emission-transition rate, theory of p-n junction, p-n junction diode and its I-V characteristics, optoelectronics devices-LEDs, laser diode, Basics of Photovoltaics- photovoltaic effect, Determination of efficiency of PV cell	
Unit- 4 Low Dimension Physics and Nanomaterials	**10 hrs**
Density of states in 0D, 1 D and 2D –Low dimensional systems: Quantum well, Quantum wire, Quantum dots, Nanomaterials and its properties, Classification of Nanomaterials, Carbon nanowires and nanotubes, Semiconductor nanomaterials, Graphene, Characterization techniques (basic ideas): Scanning Electron Microscopy and Transmission Scanning Electron microscopy	
List of Experiments:	
25. Determination of bandgap of semiconductor –Four probe method 26. I-V Characteristics of p-n junction diode 27. Characteristics of Zener diode and voltage regulation 28. Thickness of wire using laser 29. Attenuation and propagation characteristics of optical fiber cable using laser source 30. Study of I V characteristics of Tunnel diode 31. Characteristics of Solar cell and determination of its efficiency. 32. Determination of Planck constant using LED method 33. Study of Hall effect 34. Study of variation of magnetic field using Tangent Galvanometer 35. Study of diffraction grating using mono chromatic and non-monochromatic light sources 36. Characterization of ferroelectric material to study coercivity, retentivity, saturation of magnetic flux and hysteresis loss.	

Name of The Course	Biology for Engineers				
Course Code	BEE01T1002				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

Students will understand about the different dimensions of Bio Systems engineering in the field of healthcare and clinical practices.

Course Outcomes:

After completion of this course work students able to

CO1	Understand about cell, tissue, organ and systems
CO2	Understand functioning of various systems of human body
CO3	Analyse the Measuring & Recording Instruments for recording vital parameters in diagnosis
CO4	Understand and examine the role of Monitoring Instruments in clinical practices
CO5	Demonstrate the capability of the modern imaging systems for diagnostic applications
CO6	Evaluate the applications of Medical devices for Therapy and Prosthetic in biosystems

Text Book (s):

- Introduction to Biomedical Engineering by John Enderle, Susan Blanchard and Joseph
  - Bronzino, Academic Press ELSEVIER
- Tissue Engineering by Clemens van Blitterswijk (Editor),Peter Thomsen (Editor),Jeffrey
  - Hubbell (Editor),Ranieri Cancedda (Editor),Joost de Bruijn (Editor),Anders Lindahl
  - (Editor),Jerome Sohier (Editor),David F. Williams (Editor), Academic Press
- Molecular Cell Biology by Harvey Lodish (Author),David Baltimore (Author),Arnold Berk (Author),W H Freeman & Co (Sd)
- Cell Biology & Molecular Biology by N. Arumugam, Saras Publication

Reference Books:

- Medical Physics by John R. Cameron and James G. Skofronick, John Wiley & Sons, NY
- Handbook of Biomedical Instrumentation by R. S. Khandpur, Tata McGraw- Hill
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

Course Contents

Unit-1: Cell and Molecular Biology	**7 hours**
Cell membrane structure and Intracellular compartments, Macromolecules: Structure, Shape and Information, Introduction to the central Dogmaof information transfer.	
Unit 2–: Physiology	**13 Lectures**
Digestion- Physiology of digestion, regulation of food intake and digestive secretions. ***Coordination*** - Structure of Brain and Neurons; Physiology of nerve impulse conduction, excitability of membranes, electrical and	

chemical transmission between cells. ***Cardiovascular System*** - Physiology of blood – compositions & structure, coagulation; Heart: beat, initiation, conduction and regulation; Physiology of Circulation. ***Respiration and Excretion-*** Physiology of respiration; Exchange and transport of gases and its regulation. Physiology of Excretion, Fluid and electrolytes balance, Acid Base balance. Roles of kidney in body water regulation.
Unit-3 Biopotentials **6 hours**
Resting potential, action potentials, synaptic potentials, Exhitatory Post Synaptic Potentials (EPSP) Inhibitory Post synaptic Potentials (IPSP), interaction of signals and Bioelectric signals ECG, EMG, EEG, and its generation and propagation
Unit-4 Patient Recording and Monitoring Instruments **7 hours**
Recording Electrodes, Electrocardiograph, Electroencephalograph, Electromyograph Patient Monitoring Systems, Foetal Monitoring Instruments, Oximeters, Blood Flowmeters, Pulmonary Function Analysers, Blood Gas Analysers, Blood Cell Counters, Audiometers and Hearing Aids,
Unit-5 Modern imaging systems and Advances in Healthcare **6 hours**
X-ray, X-ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System, Ultrasonic Imaging Systems.
Unit-6 Advances in Healthcare **6 hours**
Tissue engineering as therapeutics, electromagnetic therapy, bio ceramics, microrobots and nanobots, Biomaterials, Radiotherapy, Ultrasound Enhanced Nano medicine, and targeted drug delivery, Automated Drug Delivery Systems Artificial skin, limb, advancement in prosthetics, Biocompatibility of artificial organs

Name of The Course	Introduction to Python Programing				
Course Code	BCS01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

1. This course helps to providestudentswithan introductiontoprogramming
2. It also explains the fundamental concepts of packages and data types
3. Introduce the concept of data visualisation using matplotlib and seaborn

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Install and run the Python interpreter and understand the basics of python.
CO2	Create and execute Python programs
CO3	Implement functions, tuples and dictionaries.
CO4	Explore packages and implement programs.
CO5	Plot data with matplotlib libraries
CO6	Explore and implement data visualization

Text Book (s)

1.Python Programming using Problem Solving Approach by Reema Thereja, Oxford Publication.
2.Python Programming: An Introduction to Computer Science 2nd Edition by John Zelle

Reference Book (s):

1. Python Programming for the Absolute Beginner, 3rd Edition by Nicheal Dawson

Course Content:

Unit I: Introduction to Python and Computer Programming **8 lecture hours**
Installing Python,Introuction to google colab,Data Types, Variables, Basic Input-Output Operations, Basic Operators.
Unit II: Boolean Values, Conditional Execution, Loops, Lists and List **8 lecture hours**
Processing, Logical and Bitwise Operations,Making decisions in Python,Python's loops,Logic and bit operations in Python,Lists - collections of data, Sorting simple lists - the bubble sort algorithm, Lists - some more details, Lists in advanced applications.
Unit III: Functions, Tuples, Dictionaries, and Data Processing **8 lecture hours**
Writing functions in Python,How functions communicate with their environment?,Returning a result from a function, Scopes in Python, Functions, Tuples and dictionaries
Unit IV: Modules, Packages, String and List Methods **8 lecture hours**
Using modules,Some useful modules,What is package?Characters and strings Python's nature of strings,String methods
Unit V: Data Visualization using matplotlib **8 lecture hours**
Data Visualization,Introduction to Matplotlib,Line Plot,Bar Chart,Histogram Plot,Box and Whisker Plot,Scatter Plot
Unit-VI : Data Visualization using Seaborn **8 lecture hours**
Visualizing Statistical Relationships,Plotting with Categorical Data,Visualizing the Distribution of a Dataset.

Name of The Course	**Discrete Mathematics**			
Course Code	BBS01T1006			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective:

The objective of this course is to familiarize the prospective computer scientists with the techniques of mathematical reasoning, logical thinking, abstract mathematical discrete structures so that they may apply a particular set of mathematical facts in relevant situations.

Course Outcomes:

After successful completion of the courses, students will be able to:

CO1	Apply rule of inference for connecting and validating logical statements and use proof techniques. (K2, K3)
CO2	Use counting techniques to solve various counting problems. (K2, K3)
CO3	Apply the concepts of sets, relation, functions and mathematical induction. (K2, K3, K4)
CO4	Classify the algebraic structures as Group, Ring, field. (K2, K3, K4)
CO5	Classify the structures of graph and tree and use them to simplify various problems. (K2, K3, K4)

Text Book:

1.*Kenneth H. Rosen*, **Discrete Mathematics and Its Applications**, McGraw-Hill.
2. Susanna S Epp, **Discrete Mathematics with Applications,** 4th edition, Wadsworth Publishing Co. Inc
3. *C L Liu and Mohapatra*, **"Elements of Distcrete Mathematics",** a computer oriented approach, 3rd edition, McGraw Hill.

Reference Books:

1. *J P Trembley, R Manohar,* **Discrete Mathematical Structures and it's Application to Computer Science,** TMG Edition, Tata McGraw-Hill.
2. *Norman L Biggs*, **Discrete Mathematics,** 2nd Edition, Oxford University Press.
3. *SemyourLipschutz and Marc Lipson* , **Schaum's Outlines Series**

Course Content:

Unit-1	**Contact Hours:8**
Syntax, Semantics, Validity and Satisfiability, Basic connectives and Truth Tables, Logical Equivalance, ,the laws of logic, Logical implication, Rules of inference,Normal form(CNF,DNF), Predicate logic, Universal and Existantial quantifiers, skolemization. Proof Techniques:Some terminologies, Proof methods and strategies, Forward proof, Proof by contradiction, Proof by contraposition, Proof of necessity and sufficiency.	
Unit-2	**Contact Hours:6**
Counting Techniques: Basic counting techniques, inclusion and exclusion, pigeon-hole principle, permutation and combination	
Unit-3	**Contact Hours: 12**
Operations and laws of sets**,** Cartesian product, binary relation, partial order relation, Equivalence relation, Functions, Bijective function, inverse and composition of function, size of a set, countable and uncountable set, Cantor's diagonal argument and the power set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The well -Ordering principle, Recursive definition, prime numbers, greatest common divisor, Euclidean algorithm, the fundamental theorem of arithmetic.	
Unit-4	**Contact Hours: 10**
Algebraic structures with one binary operation: Semi Group, Monoid, Groups, Subgroups, Congruence relation and quotient structures, Free and Cyclic Monoid and Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism, Algebraic structures with two binary operation: Ring ,Integral domain and Field.	
Unit-5	**Contact Hours: 6**
Graphs and their properties, degree, connectivity, path cycle, sub graphs, isomorphism, Eulerian and Hamiltonian walks, Graph coloring, coloring maps and planer graphs, coloring vertices and edges, list coloring, perfect graph. Trees: Definitions, properties and examples, rooted trees, trees and sorting, weighted trees and prefix codes, bi-connected components and articulation points, shortest distances.	

Name of The Course	Introduction to Machine Learning				
Course Code	BCS01T1008				
Prerequisite	Nil				
Corequisite	Nil				
Antirequisite	Nil				
	L	**T**	**P**	**C**	
	2	0	0	2	

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To develop skills of using recent machine learning software for solving practical problems.
3. To gain experience of doing independent study and research.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of numpy arrays
CO2	Apply the concepts of vector arithmetic in solving real time problems.
CO3	Implement the supervised machine learning algorithm.
CO4	Implement the Un- supervised machine learning algorithm.
CO5	To develop a project using machine learning algorithm.

Text Book (s)

1. 1.Introduction to machinelearning,EthemAlpaydin. — 2nd ed.,The MIT Press, Cambridge,Massachusetts, London, England.
2. Introduction to artificial neuralsystems, J. Zurada, St. Paul: West.

Reference Book (s):

1. 1Machine Learning, Tom MMitchell.
2. The Elements of StatisticalLearning, Trevor Hastie, Robert Tibshirani, Jerome Friedman,Springer
3. Basics of Linear Algebra forMachine Learning, Jason Brownlee

Course Content:

Unit 1:Introduction
Introduction to NumPy Arrays NumPy N-dimensional Array Functions to Create Arrays Combining Arrays Extensions Index, Slice and Reshape NumPy Arrays From List to Arrays Array Indexing Array Slicing Array Reshaping Matrices
Unit 2:Vector Arithmetic
Vectors and Vector Arithmetic and vector Norms Vector Arithmetic, Norm L1 Norm, Vector L2 Norm, Matrix Arithmetic Matrix Symmetric Matrix Triangular Matrix Diagonal Matrix Identity Matrix Orthogonal Matrix Transpose Inverse Trace Determinant Rank Sparse Matrix Problems with Sparsity Sparse Matrices in Machine Learning Working with Sparse Matrices Sparse Matrices in Python Eigenvectors and Eigen values Singular Value Decomposition Calculate Singular Value Decomposition ,mean, median, mode, Confusion Matrix, weights, bias, covariance.
Unit 3:Supervised Machine Learning

Supervised Machine Learning Algorithm Regression, Decision Tree, Random Forest, KNN, Logistic Regression, Classification
UNIT4:Un-Supervised Machine Learning Algorithm
Apriori algorithm, K-means, Clustering
UNIT5:Mini Project

Name of The Course	Creativity, Innovation and Entrepreneurship				
Course Code	BLEUCT1003				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To make students aware of the need of self-earning system.
2. To develop interest in creative business ideas.
3. To make them capable of becoming entrepreneurs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the social and economic problems in strategic way and develop creative design thinking and its approach
CO2	Discover the self-potential and skills to effectuate the idea of solving a problem
CO3	Identify the consumers and market to the idea
CO4	Propose a solution in form of product and evaluate the risks

Reference Book (s):

- Stay Hungry Stay Foolish, Rashmi Bansal, Westland, 2008.
- Sahlman, William A. "Some Thoughts on Business Plans." Chap. 9 in *The Entrepreneurial Venture*. 2nd ed. by William A. Sahlman, Howard H. Stevenson, Michael J Roberts, and Amar V. Bhide, 138–176. Harvard Business School Press, 1999.
- Ronstadt R, Robert R. Entrepreneurship: Text, cases and notes. Dover, MA: Lord Publishing; 1984.
- Steyaert C, Dey P. 1. The books on social entrepreneurship we edit, critique and imagine. Social Entrepreneurship: An Affirmative Critique. 2018 Mar 30:1.
- Harrison RT, Leitch CM, editors. Research handbook on entrepreneurship and leadership. Edward Elgar Publishing; 2018 Jan 26.
- Kuratko DF. Entrepreneurship: Theory, process, and practice. Cengage Learning; 2016 Jan 8.

Course Content:

Unit- 1:	**6 hours**

Problem Discussion and Idea generation, Discussion Strategies, What is Idea Generation? – Definition, Techniques and Success Factors, Innovation management, Tools and techniques for generating ideas, Types of idea challenges**.** Problem Classification: Problem Identification, Classification, Resources, Facilities, Idea of solution, Proof of concept. Design Thinking , Understand Design Thinking as a problem solving process, Describe the principles of Design Thinking, Describe the Design Thinking process **Activity: (i)** Identification of a social problem its classification and existing solution (ii) Applying Design Thinkingto a problem worth solving with design thinking steps
Unit-2: 4 hours
Self Discovery and Effectuation: Effectuation principles, Entrepreneurship Styles, Case studies and success stories to draw the difference. **Activity:** (i) Finding your flow (ii)Entrepreneurship styles quiz (M1 to M5 activity)
Unit-3: 6 hours
Customer and solution: Concept of consumer and customer, Market types, Influence of market types, Activity for the students to identify market types based on product and services. Market segmentation and targeting, Criteria for evaluating market segments. **Activity:** Identify your market type
Unit-4: 8 hours
Value Proposition Lean canvas template, Business model canvas, Value Proposition Canvas, Identifying risky assumptions, Prioritising your risk assumptions, Seeking external advice to calibrate your risks. Validation, Refine unique value proposition, Blue ocean strategy **Activity:** (i) Identify the problem, solution and customer segment of existing companies (ii) Identify what is your customer segment, customer jobs, gains, and pains. (iii) Identify your blue ocean strategy.

Name of The Course	Creative and Liberal Arts				
Course Code	BLEUCT1002				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

Course aims to prepare open-minded, creatively engaged, and culturally aware people to live and play together. Students must show an interest in the liberal arts either by majoring in an artistic field or the humanities (art, English, film, music, theatre, philosophy, political science, history, etc.) or by simply enjoying and getting involved in the arts. Course is designed to generate an atmosphere for students to express and explore the liberal arts, creativity, and artistic interests or skills.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Foster a respect and appreciation for art as a mutual space for communication.
CO2	Understand and respect other perspectives, and promote others artistic endeavors.

Text Book (s)

- Mark Baskinger, William Bardel (2013), Drawing Ideas: A Hand-Drawn Approach for Better Design, Watson-Guptill publication (ebook).
- Paul Klee, Paul Findlay (1966), On Modern Art, Faber & Faber publication, London
- Writing Essays For Dummies' by Mary Page and Carrie Winstanley
- Stuart Carey (2019), From Clay to Kiln, Book Authority publication
- https://chrisoatley.com/how-to-write-a-comic-book-script/

Additional References

- WHAT IS Modern and Contemporary Art?https://imma.ie/wp-content/uploads/2018/10/whatismodernandcontemporaryartmay2010.pdf
- Poetic Devices (Definitions with Examples) and Rhyme-http://dg099.k12.sd.us/12B/Shared%20Documents/poetry%20devices.pdf
- Reading Film as Complex Text Angela Orr EianGilbert https://www.washoeschools.net/cms/lib/NV01912265/Centricity/Domain/253/Social%20Studies/Reading%20Film%20as%20Complex%20Text.pdf

Name of The Course	Environmental Science				
Course Code	BCEUCT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Demonstrate various methods of water treatment for domestic and industrial purpose.
- Explanation of different types of batteries and its commercial applications
- Demonstration and familiarization of impact of waste on environmental degradation.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand various methods of water treatment for domestic and industrial use
CO2	Differentiate various categories of waste and its disposal techniques
CO3	Identify various batteries and recognize its commercial applications
CO4	Understand different tools of Green Chemistry towards generating a zero waste environment
CO5	Apply the knowledge of environmental pollution and degradation to solve related problems

Text Book (s)

- Text Book of Engineering Chemistry, S. S. Dara, S. Chand & company,2013, 11th Edition
- Engineering Chemistry, Jain &Jain, Dhanpatrai&Dhanpatrai,2015,sixteenth edition
- A Test Book of Environmental Chemistry & Pollution Control, S.S. Dara, S. Chand & Co., 2006, 11th edition
- Environmental Studies, Ranu Gadi, Sunita Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s):

- Environmental Chemistry, B.K. Sharma & H. Kaur, Goel Publishing House,2014, 14th edition.
- Environmental Studies, R. Rajgopalan, Oxford Publication,2016, 3rd edition.
- Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.

E-Book (s) :

- Water purification, Alexandru Grumezescu, First edition.
- Solid waste management by Stephen Burnley, Willey publication,2014
- Air Pollution, S. K. Agarwal, APH Publishing, 2005

Course Content:

Unit-1 Water Technology **6 hours**
Purification of Domestic water, Boiler troubles, softening methods of industrial water.
Solid Waste Management and treatment Technology: 4 hours
Introduction to E-Waste, Biomedical waste and Solid waste. Treatment: Collection, segregation, transportation and its disposal techniques
Battery Technology & Sustainable Energy Sources: 4 hours
Introduction to Battery, reversible and irreversible batteries. Examples: Lead-acid battery, Nickel-Cadmium Battery, Lithium ion battery and fuel cell Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas.
Unit-4 Green Chemistry **4 hours**
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.
Unit-5 : Environmental Pollution & Current Environmental Issues: 4 hours
Air pollution- Urban air quality standards as per WHO, its sources and controlling methods. Water pollution- water quality index as per WHO, its sources and controlling methods, Climate Change and Global warming: Effects, Acid Rain, Ozone Layer depletion, Photochemical Smog,

Name of The Course	**Computer Workshop**			
Course Code	BCS01T1004			
Prerequisite	Nil			
Corequisite	Nil			
Antirequisite	Nil			
	L	**T**	**P**	**C**
	2	0	0	2

Course Objectives:

Students of Computer Engineering have to work with various hardware and software not only during academia but also in company. Thus, students should get familiar with various hardware, software, operating systems and networking.

This course will provide student a much needed knowledge of computer hardware and networking, enabling them to identify and rectify the onboard computer hardware, software and network related problems. With the help of this course the student will be able to understand the hardware specifications that are required to run operating system and various application programs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concept and structure of computer hardwareand networking.

CO2	Identify the existing configuration of the computers and peripherals.
CO3	Upgrading the system as and when required.
CO4	Apply their knowledge about computer peripherals to identify / rectify problems onboard.
CO5	Integrate the PCs into local area network and re-install operating system and various application programs.
CO6	Manage data backup and restore operations on computer and update application software.

Reference Book (s)

1. Hardware Bible by Winn L. Rosch
2. Hardware and Software of Personal Computers by Sanjay K. Bose
3. Fundamentals of Computers by V. Rajaraman
4. Computer Studies - A first course by John Shelley and Roger Hunt
5. Computer Fundamentals, MS Office and Internet & WebTechnology by Dinesh Maidasani
6. Modern Computer Hardware Course by M Lotia, P Nair, P Lotia

Course Content:

Assembly of Computer: 6 Hours
Introduction to hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Working of SMPS. Study of various ports. Steps and precautions to assemble computer.
Assembly of Laptop: 4 Hours
laptop hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Study of various ports. Steps and precautions to assemble laptop.
Computer Network Tools: 4 Hours
Introduction to computer network. Study of various topologies. Preparing the network cable using crimping tools and connectors. Study of various network environments.
Operating System and Software Installations : 6 Hours
Introduction to operating system. Types of operating system (Windows and Linux). Window:-Evolution of operating system. Introduction to software. Types of software (MS office, VLC media player, Win rar), etc. Linux:- Evolution of operating system. Introduction to software. Types of software (open office, web browser, etc.) Case study of Installations step for operating system and application softwares.
Internet : 4 Hours
Introduction and evolution of internet. Study of various internet based services like Email, social network, chat, etc. Introduction to cyber security and cyber laws.
Server : 4 Hours
Introduction to server. Difference between server and normal desktop. Evolution of servers. Study of various servers like Email, data, domain, etc.

List of Experiments: The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency. Following is the list of experiments for guidance. As it is laboratory course list is as per content given above

Name of The Course	Alexa Skilling				
Course Code	BCS01T1007				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
		L	**T**	**P**	**C**
		0	0	2	2

Course Objectives:

3. To introduce the student to the idea of voice assistant devices
4. To provide a foundation to create alexa skills

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Alexa
CO2	Understand Alexa Skill Set
CO3	Design an engaging Voice User Interface
CO4	Setting Up AWS
CO5	Create alexa skills.

Text Book (s)

- Build your own Alexa skill by Andrew Odewahn, Brian Jepson Publisher(s): O'Reilly Media, Inc.ISBN: 9781491974650
- Alexa Skills Projects, By Madhur Bhargava, Packt

Reference Book (s):

- Hands-On Chatbot Development with Alexa Skills and Amazon Lex,Sam Williams ,Packt

Course Content:

Unit 1:Introduction to Alexa
Intro to Alexa , The future of voice-based experiences , Overview of Echo, Alexa.
Unit 2:Alexa Skill Set

Build Alexa Skills, Why you should build Alexa skills, What type of Alexa skills you can create, How an Alexa skill works, The steps to build a skill, The requirements to build a skill.
Unit 3:Design an Engaging Voice User Interface
How users interact with Alexa, Voice design concepts: utterances, intents, slots, interaction model and situational design, Characteristics of a well-designed voice user interface (VUI), Key challenges of voice design.
UNIT4:Setting up AWS
Setting Up Your Alexa Skill in the Developer Portal , Setting Up A Lambda Function Using Amazon Web Services, Connecting Your Voice User Interface To Your Lambda Function.
Unit 5 : Creating alexa skills
Fact Skill,Quiz Skill & Project on Alexa Skill
Unit-6 AI in Practice **4 hours**
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.

GALGOTIAS UNIVERSITY

(Under the Uttar Pradesh Private Universities Act No. 12 of 2019)

Program: B.Tech – Mechanical, Automobile, Civil

Scheme: 2020-2021

Name of The Course	Multivariable Calculus				
Course Code	BBS01T1001				
Prerequisite	*Single variable calculus.*				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	2	4	

Course Objectives:

In modern world, calculus has become an important tool to describe change and motion and thus it is extensively used in many fields including but not limited to science, engineering, medicine, business, industry.The objective of the course is familiarizing the prospective engineers with techniques in Calculus. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Apply the convergence o f a sequence, series and Fourier series to solve problems in engineering domain. (K1, K2, K3)
CO2	Apply mean value theorems for real-valued functions and use curvature to find evolutes& involutes and test the convergence of the improper integral. (K2, K3,K4)
CO3	Apply the knowledge of multivariable differential calculus to solve various problems. (K2, K3,K4)
CO4	Apply methods to find integrals of multivariable scalar functions and relate it to solve the problems finding areas and volumes. (K2,K3,K4)
CO5	Apply the concepts of Curl, Divergence, Gradient and theorems of Green's , Stoke's and Gauss-divergence to solve various problems in the vector field. (K2,K3, K4)

Text Books:

- *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition,McGraw Hill Education.
- *George B. Thomas and Ross L. Finney*, **Calculus**, 9th Edition, Pearson Education

Reference Books:

- *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa publishers.
- *Michael D. Greenberg*, **Advanced Engineering Mathematics**, 2nd Edition, Pearson Education.

Unit-1 **Contact Hours:9**
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions, Half range Fourier sine and Half range Fourier cosine series.
Unit-2 **Contact Hours: 8**
Evolutes and Involutes, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.
Unit-3 **Contact Hours: 8**

Functions of several variables, Limits and continuity, Partial derivatives, Total differential, Derivatives of composite and implicit functions, Extreme values and saddle points, Lagrange's method of undetermined multipliers.
Unit-4 **Contact Hours: 10**
Double integrals in Cartesian and Polar coordinates, Change of order of integration, change of variables (Cartesian to polar), Applications of double integrals to find area and volume,Triple integrals in Cartesian, Applications of triple integral to find volume.
Unit-5 **Contact Hours: 10**
Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl, line integrals, path independence, potential functions and conservative fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorems (without proof& simple problems).

Name of The Course	Communication Skills				
Course Code	BCS01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	2	0	0	2	

Course Objectives:

1. *This course helps to providestudentswithan introductiontoprogramming*
2. *It also explains the fundamental concepts of packages and data types*
3. *Introduce the concept of data visualisation using matplotlib and seaborn*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Construct grammatically correct sentences for effective communication.
CO2	Build confidence in public speaking.
CO3	Enhance self-awareness for the purpose of self-improvement.
CO4	Demonstrate effective writing skills for a variety of professional and corporate settings.
CO5	Be creative and integrate essential elements for a better personality**.**

Unit-I
Communication – Definition, Importance, Features- 7Cs and ABCs Basics of Grammar -Noun Pronoun, Subject Verb Agreement, Article, Prepositions, Punctuation Sentence Structure Vocabulary Building -The concept of Word Formation, Synonyms, antonyms, and standard abbreviations. Basic Writing Skills -Brainstorming, Structure, Organisation, Outline, Precision, Coherence (Connectedness) Paragraph writing: Types and Constituents, practice Essay Writing Précis (Selected Essays)
Unit II:

Introduction of self and Goal Setting Extempore Role Play Movie Review Phonetics (Sounds)- Voice Modulation Phonetics (Transcription) Listening Skills Clear Pronunciation Tense Buster Group Discussion Group Presentation by Students
Unit III:
Technical writing style and language Official Communication: Notice, Agenda, Minutes of Meeting, Memo, Official Note, Formal Letters, Brochure, Newsletter, Resume writing

Name of The Course	Programming for Problem Solving-C				
Course Code	BCSE0IT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Provide an overview of computers and problem-solving methods using 'C' language
- Serve as a foundation for the study of programming languages.
- Learn to develop program using 'C' language.
- To develop the software using the concept of 'C' Language.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	The student would learn the basic concepts of Computer and acquire various problem solving techniques such as algorithms and flowchart.
CO2	To understand the basic terminology used in programming and able to write, compile and debug programs in 'C' programming language and to develop program logics using decision structures and loop structures.
CO3	To develop program logic using the concept of arrays and arrays of characters.
CO4	To understand the modular techniques such as functions and difference between call by value and call by reference methods.
CO5	Implement and develop small projects using the concept Structures in C programming language.
CO6	Understanding of latest advances and its applications in Computer Programming and Problem Solving.

Text Book (s)

- Alexis Leon and Mathews Leon (2001), Introduction to Information Technology, Tata McGraw-Hill.
- R.G. Dromey (2001), How to Solve it by Computer, Prentice Hall of India.
- Al Kelley and Ira Pohl (1998), A Book on C Programming in C, 4th Edition, Pearson Education.

Reference Book (s):

- E. Balagurusamy7th Edition, Programming ANSI C, McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Prentice-Hall in 1988
- Byron Gottfried, Programming with C, Schaum's Outline

Course Content:

Unit-1 Introduction to Computers and Algorithms **6 hours**
Parts of a computer, Overview of operating systems, assembler, compilers, interpreters and programming languages, Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart, Algorithm design: Problem solving approach(top down/bottom up approach), Pseudo Code: Representation of different construct, writing pseudo-code from algorithm and flowchart
Unit-2 Constructs of C **8 hours**
Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes, Operators and expressions, Types of Statements: Assignment, Control, jumping, Control statements: Decisions(if-else), Loops(while, for, do while), break, continue, case control structure, go to, exit statement
Unit-3 Arraysand Functions **8hours**
Array handling in C – declaration – single dimensional arrays, two – dimensional arrays, multi-dimensional arrays, sorting and searching on single- and two-dimensional arrays. Function– declaration - arguments (formal and actual) – return types – types of functions difference between built-in and user-defined functions, Call by Value and call by reference.
Unit-4 Structures, Union and Pointers **8 hours**
Structure Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function, unions- difference between structure and union. Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation, passing pointer variables into function.
Unit-5 String and File Handling **8 hours**
String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments. Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.
Unit-6 Advances in C Programming **7 hours**
The advances and the latest trends in the course as well as the latest applications of the areas covered in the course. The latest research conducted in the areas covered in the course. Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums. Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course.

Name of The Course	Semiconductor Physics				
Course Code	BBS01T1002				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

This course is designed to provide the knowledge of quantum and band theory for the explanation of semiconductors. The students will also learn about the application of semiconductors in optoelectronic devices. The topics on low dimension /nanomaterial enable the students to think of new applications in semiconductor areas.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the energy band in solids and electron occupation probability
CO2	Understand the physics of semiconductor and develop the ability to choose the appropriate semiconductor for engineering applications
CO3	Apply the knowledge of diode to the development of new and novel optoelectronic devices
CO4	Utilize the knowledge of the low dimensional/ nano materials for engineering applications and understand the basic characterization techniques
CO5	Apply the knowledge of physics to determine the physical quantities/ constants, diode characteristics using experimental set up and analyses the results with maximum accuracy.

Text Book (s)

- J. Singh , Semiconductor optoelectronics, Physics and Technology, Mc-Graw –Hill Inc. 1995.
- S.M. Sze, Semiconductor Devices: Physics and Technology, Wiley 2008.
- Introduction to Nanotechnology C P Poole, Frank J. Owens, John Wiley & Sons, 2011, ISBN 978-81-265-1099-3.
- B.Sc. Practical Physics by C.L Arora , S. Chand Limited.

Reference Book (s):

- B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.
- Introduction to Nanoscience and Nanotechnology, KK Chattopadhyay, A N Banerjee, Phi Learning Pvt Ltd., New Delhi, 2012, ISBN-978-81-203-3608-7.
- Nanotechnology Science Innovation & Opportunity, Lynn E Foster, Pearson publication, 2008, ISBN-9788131711187.
- Nouredine Zettili, Quantum Mechanics: concepts and applications, 2nd Edition, Wiley, UK, 2009
- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

Unit 1 Quantum and Band Theory of electron	**6 hrs**
Fermi Dirac distribution function and Fermi level, quantum free electron theory, density of states, Energy band in solids, E-K diagram and Brillouin zone, effective mass, concept of holes.	
Unit 2 Semiconductor	**8 hrs**
Types of semiconductor, Fermi level in semiconductor, effect of carrier concentration and temperature on fermi level, direct-indirect band gap semiconductors, compound semiconductors, Conductivity and mobility, recombination process, Hall effect and applications.	
Unit 3 Applications of Diodes	**8 hrs**

Concept in optical transitions in bulk semiconductors- absorption process, recombination process, explanation for spontaneous emission-stimulated emission-transition rate, theory of p-n junction, p-n junction diode and its I-V characteristics, optoelectronics devices-LEDs, laser diode, Basics of Photovoltaics- photovoltaic effect, Determination of efficiency of PV cell
Unit- 4 Low Dimension Physics and Nanomaterials **10 hrs**
Density of states in 0D, 1 D and 2D –Low dimensional systems: Quantum well, Quantum wire, Quantum dots, Nanomaterials and its properties, Classification of Nanomaterials, Carbon nanowires and nanotubes, Semiconductor nanomaterials, Graphene, Characterization techniques (basic ideas): Scanning Electron Microscopy and Transmission Scanning Electron microscopy
List of Experiments:
• Determination of bandgap of semiconductor –Four probe method • I-V Characteristics of p-n junction diode • Characteristics of Zener diode and voltage regulation • Thickness of wire using laser • Attenuation and propagation characteristics of optical fiber cable using laser source • Study of I V characteristics of Tunnel diode • Characteristics of Solar cell and determination of its efficiency. • Determination of Planck constant using LED method • Study of Hall effect • Study of variation of magnetic field using Tangent Galvanometer • Study of diffraction grating using mono chromatic and non-monochromatic light sources • Characterization of ferroelectric material to study coercivity, retentivity, saturation of magnetic flux and hysteresis loss.

Name of The Course	**Biology for Engineers**			
Course Code	**BEE01T1002**			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

Students will understand about the different dimensions of Bio Systems engineering in the field of healthcare and clinical practices.

Course Outcomes:

After completion of this course work students able to

CO1	Understand about cell, tissue, organ and systems
CO2	Understand functioning of various systems of human body
CO3	Analyse the Measuring & Recording Instruments for recording vital parameters in diagnosis
CO4	Understand and examine the role of Monitoring Instruments in clinical practices
CO5	Demonstrate the capability of the modern imaging systems for diagnostic applications
CO6	Evaluate the applications of Medical devices for Therapy and Prosthetic in biosystems

Text Book (s):

- Introduction to Biomedical Engineering by John Enderle, Susan Blanchard and Joseph
  - Bronzino, Academic Press ELSEVIER
- Tissue Engineering by Clemens van Blitterswijk (Editor),Peter Thomsen (Editor),Jeffrey
  - Hubbell (Editor),Ranieri Cancedda (Editor),Joost de Bruijn (Editor),Anders Lindahl
  - (Editor),Jerome Sohier (Editor),David F. Williams (Editor), Academic Press
- Molecular Cell Biology by Harvey Lodish (Author),David Baltimore (Author),Arnold Berk (Author),W H Freeman & Co (Sd)
- Cell Biology & Molecular Biology by N. Arumugam, Saras Publication

Reference Books:

(1) Medical Physics by John R. Cameron and James G. Skofronick, John Wiley & Sons, NY
(2) Handbook of Biomedical Instrumentation by R. S. Khandpur, Tata McGraw- Hill
(3) Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

Course Contents

Unit-1: Cell and Molecular Biology **7 hours**
Cell membrane structure and Intracellular compartments, Macromolecules: Structure, Shape and Information, Introduction to the central Dogmaof information transfer.
Unit 2–: Physiology **13 Lectures**
Digestion- Physiology of digestion, regulation of food intake and digestive secretions. ***Coordination*** - Structure of Brain and Neurons; Physiology of nerve impulse conduction, excitability of membranes, electrical and chemical transmission between cells. ***Cardiovascular System*** - Physiology of blood – compositions & structure, coagulation; Heart: beat, initiation, conduction and regulation; Physiology of Circulation. ***Respiration and Excretion-*** Physiology of respiration; Exchange and transport of gases and its regulation. Physiology of Excretion, Fluid and electrolytes balance, Acid Base balance. Roles of kidney in body water regulation.
Unit-3 Biopotentials **6 hours**
Resting potential, action potentials, synaptic potentials, Exhitatory Post Synaptic Potentials (EPSP) Inhibitory Post synaptic Potentials (IPSP), interaction of signals and Bioelectric signals ECG, EMG, EEG, and its generation and propagation
Unit-4 Patient Recording and Monitoring Instruments **7 hours**
Recording Electrodes, Electrocardiograph, Electroencephalograph, Electromyograph Patient Monitoring Systems, Foetal Monitoring Instruments, Oximeters, Blood Flowmeters, Pulmonary Function Analysers, Blood Gas Analysers, Blood Cell Counters, Audiometers and Hearing Aids,
Unit-5 Modern imaging systems and Advances in Healthcare **6 hours**
X-ray, X-ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System, Ultrasonic Imaging Systems.
Unit-6 Advances in Healthcare **6 hours**
Tissue engineering as therapeutics, electromagnetic therapy, bio ceramics, microrobots and nanobots, Biomaterials, Radiotherapy, Ultrasound Enhanced Nano medicine, and targeted drug delivery, Automated Drug Delivery Systems Artificial skin, limb, advancement in prosthetics, Biocompatibility of artificial organs

Name of The Course	Engineering Graphics and Introduction to Digital Fabrication				
Course Code	BME01T1001				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To establish the usage of basics of engineering graphics in product design.
2. To introduce the concept of product design.
3. To introduce graphics software and apply graphics software for devloping product model.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Sketch orthographic projection of points and lines.
CO2	Draw orthographic projection of two-dimensional planes and surfaces.
CO3	Draw orthographic views from pictorial drawings.
CO4	Develop a solid model using solid works
CO5	Define and demonstrate the use of techniques for processing of CAD models forrapid prototyping

Text Book (s)

- K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
- P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.
- Chee Kai Chua, Kah Fai Leong(2016), 3D Printing And Additive Manufacturing: Principles And Applications, WSPC
- Ben Redwood, Filemon Schöffer & Brian Garret(2017), The 3D Printing Handbook: Technologies, design and applications, 3D Hubs B.V

Reference Book (s):

- Course material uploaded on LMS

UNIT I Projection of Points, Lines And Plane Surface **8** hours
Orthographic projection - First angle projection - projection of points and Projection of straight lines inclined to one principal plane –Projection of planes inclined to one principal plane.
Unit II: Projection of Solids **8 hours**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.
Unit III: Conversion of Pictorial drawings into Orthographic views 8 hours
Representation of Three Dimensional objects – Layout of views- Sketching of multiple views from pictorial view of object.
Unit IV: Solid Modeling **8 hours**
Modeling of simple solids in Polyhedra, Regular and Irregular polyhedra, solids of revolution. 3D Modelling on Solidworks– To prepare part model using 2 D drawing and with basic extrusion and revolve commands.
Unit V: Exercises on 3D Printing **8 hours**
Introduction to 3 D printing, Slicing / Pre-processing, Fused deposition modelling technique, design and print 3D models like stepped shaft model and flange coupling model.

Name of The Course	Basic Electrical and Electronics Engineering				
Course Code	BEE01T1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	2	3	

Course Objectives:

1. To understand the basic concepts of magnetic circuits, electro magnetism and electrostatics.
2. To understand and analyses AC & DC circuits.
3. To understand the Network Theorem and Semiconductor Devices.
4. To understand basic semiconductor devises
5. To understands sensors and transducers

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand relationship between different electrical parameters.
CO2	Students will develop an ability to analyze DC and AC Circuits of different configurations.
CO3	Understand magnetic aspects of electric current.
CO4	Understand BJT and its characteristics, connections, diode biasing.
CO5	Understand the sensor and transducer.
CO6	Demonstrate the applications of network theorems and semiconductor devices

Reference Book (s):

1. Textbook of Electrical Engineering, B.L. Theraja, Vol. I & II, Twenty, S. Chand & Co 1997 Second.
2. Basic Electrical Engineering, D C.Kulkshreshtha, McGraw,2012 , First.
3.Introduction to Electrical Engineering, Naidu, Kamakshaia, Tata McGraw Hill, 2000, Third
4. Basic Electrical Engineering, H. Cotton, CBC, 2005, Seventh
5.Laboratory courses in Electrical Engg, S G Tarnekar, P K Kharbanda, S B Bodkhe, S D Naik, S. Chand & Co, 2010, Second.
6. Brian R Eggins - Biosensors an Introduction , First edition, John Wiley & Sons Publishers, 1996.
7. Loic J Blum, Pierre R Coulet - Biosensors Principles and Applications, First edition, Marcel Dekker,Inc, 1991.
8. Donald G. Buerk - Biosensors Theory and Applications, First Edition Technomic Publishing. Co, Inc, 1993.

Unit I: D.C. Circuits
Circuits Elements(R, L, C), Kirchhoff's Laws, Superposition Principle and theorem, Norton's theorem, Thevenin's Theorem, Voltage source, (definition, characteristics of practical source, equivalent current source) Star-Delta transformation.
Unit II: Magnetic circuits
Flux, mmf, reluctance, analogous electric circuits, simple calculations for composite magnetic circuits.
Unit III: AC Circuits
Periodic functions, average &rms values, Steady state behaviors with sinusoidal excitation, phasor representation, reactance and impedance, Series and Parallel A.C. circuits, resonance, power in A. C. circuits, power factor.
Unit IV: Bipolar Junction Transistors
Basic diode concept, different types of rectifier circuits, zener diode voltage regulation concept Bipolar junction transistors, CB, CE and CC configurations and characteristics.
Unit V:Transducers and Sensors
Sensor and Transducer Definitions, Criteria to Choose a Sensor, Basic Requirements of a Sensor or Transducer, Classification of Sensors, Analog and Digital Sensors, Biosensors- Advantages and limitations, biosensors for environmental monitoring, biosensors in healthcare applications
Unit VI: Applications
Application of network theorem, Application of Diodes, Application of Bipolar Junction Transistor
List of Experiments (At least 6 Experiments)
• To familiarize with Electrical and Electronics Lab Equipment and basic Electronics

Components

- To verify (i) Kirchhoff's Current law (ii) Kirchhoff's Voltage law.
- To verify Thevinin's theorem.
- To verify Norton's theorem.
- To verify maximum power transform theorem.
- Observe the given waveform (Sinusoidal/Square/Triangular) and calculate it's Frequency, Peak Value, Average Value, RMS Value and Form factor.
- To plot the V-I Characteristics of P-N Junction Diode and calculate the forward and reverse resistance of the Diode.
- Verification of Regulation action of ZENER Diode.
- To connect the Wave Shaping Circuits (Clipper Circuit) and observe and sketch the Wave form.
- To verify the working of Full Wave Rectifier Circuit (Bridge Rectifier) and calculate it's efficiency.

- To plot the input and output characteristics of a Bipolar Junction Transistor (BJT) in Common Emitter (CE) connection.
- To verify the working of Full Wave Rectifier Circuit (using Centre tapped transformer) and calculate it's efficiency.
- Project – Students should be encouraged to make a working model/Project to demonstrate any Transducer/Sensor action or any related field

Name of The Course	AI Fundamentals				
Course Code	BCS01T1002				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	2	0	0	2	

Course Objectives:

- *Provide an overview of Artificial Intelligence and its applications*
- *Develop the ability to understand and apply data analysis on real world data*
- *Provide an overview of Machine Learning*
- *Introduce the cutting edge technologies and the ethical guidelines*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Artificial Intelligence
CO2	Understand the principles of AI and its lifecycle
CO3	Apply the concepts of data analysis in real world scenario
CO4	Identify the characteristics of machine learning that makes it useful to solve real-world problems
CO5	Identify applications of AI in relevant disciplines
CO6	Understand the latest trends in AI and ethical issues

Text Book (s)

- Norvig, Peter, and Russell, Stuart Jonathan. Artificial intelligence : a modern approach. United Kingdom, Pearson, 2016.
- Bishop, Christopher M.. Pattern Recognition and Machine Learning. Switzerland, Springer New York, 2016.

Reference Book (s):

- Rich, Elaine. Artificial Intelligence 3E (Sie). India, Tata McGraw-Hill Publ., 2019.
- Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning, MIT Press, 2012
- Linoff, Gordon S. Data analysis using SQL and Excel. John Wiley & Sons, 2015.

Unit-1 Introduction to AI	**4 hours**
Introduction to Artificial Intelligence, Foundations of AI, History of AI, AI Games, Agents and Environment, Risk and Benefits of AI	
Unit-2Principles of AI	**6 hours**
Knowledge Representation, Problem Solving, Searching and its Strategies, Heuristic Search, AI Project Cycle, Problem Scoping, Data Acquisition, Data Exploration, Modeling	
Unit-3 Data Analysis	**6 hours**
Sort, Filter, Conditional Formatting, Charts, Pivot Tables, Tables, What if Analysis, Solver, Descriptive Statistics, Correlation, Regression, Introduction to Programming Languages for AI.	
Unit-4 Introduction to Machine Learning	**5 hours**
Introduction to Machine Learning, Types of Learning, Use of Probability and Statistics in AI, Data Mining and Analysis Techniques	
Unit-5 Applications of AI	**5 hours**
AI applications in Agriculture, Climate, Healthcare, Transport, Automotive Industry, Civil Engineering, Education, Robotics, Finance, Law and Legal practice, Media and Entertainment, Data Security, Tourism	
Unit-6 AI in Practice	**4 hours**
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.	

Name of The Course	Data Analytics (Excel and Tableu)			
Course Code	BCS01T1001			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	1	0	0	1

Course Objectives:

1. *This course helps to understand data and usage of data in solving real time problems.*
2. *It also explains the fundamental concepts of big data analytics and data visualization.*
3. *Introduce the concept of Tableau and data analysis.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand data and usage of data in data analytics.
CO2	Apply data analytics techniques for visualization through Excel.
CO3	Visualize trends and discover insights of data analysis using tableau

Text Book (s)

1. Microsoft Excel 2013 Step by Step by Curtis D. Frye; Microsoft Press 2013.
2. Learning Tableau by Joshua N. Milligan,ISBN 139781784391164, PACKT Books - Packt Publishing

Reference Book (s):

1. Excel: Quick Start Guide from Beginner to Expert, by William Fischer

Unit I: Introduction to Data Analytics **2 hours**
Installing Data Analysis Tool in Excel, sort, Filter, Conditional Formatting, Pivot Table
Unit 2: Manipulation of Excel Data **3 hours**
Working with Formula: Data Filtering, Sorting, Use of Range, Functions: SUM(), AVERAGE(), MAX() & MIN(), COUNT() & COUNTA(), IF(), Data Representation using Charts & Graphs, Creation of Pivot table, Create a Chart, Change Chart Type, Switch Row/Column, labels and legends, Print Area
Unit 3:Exploring Analysis Toolpack **2 hours**
Histogram, Descriptive Statistics, Moving Average, Exponential, Correlation, Regression
Unit 4: Introduction to Tableau **3 hours**
Introduction about Tableau, Installing Tableau Public, Getting Data, visualizing data on maps, tableau worksheets, Scatter plot and graphs, Applying filter, Data highlighters, predictions,

Name of The Course	Embedded Technology and IoT				
Course Code	BEE01T1004				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

- To provide the awareness of major embedded devices and interfacing devices
- To understand key technologies in Internet of Things.
- To analyze, design or develop parts of an Internet of Things solution for IoT applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2	Recognize and analyze given embedded system design and its performance.
CO3	Identify the programming environment to develop embedded solutions.
CO4	Demonstrate application based competencies in Embedded Programming
CO5	Identify and adopt knowledge of the terminology, requirements and constraints for IoT system development.
CO6	Demonstrate IoT system for smaller applications

Course Content:

UNIT IINTODUCTION TO EMBEDDED SYSTEM
Basic components of Embedded system, Programming Language Classification of Embedded system, Advantage & Disadvantage, Difference between Microprocessor & Microcontroller, Classification based on architecture, Memory Classification, Description of RAM, Description of CPU Registers, Introduction to Embedded C, Difference between C & Embedded C.
UNITII CONTROL STATEMENTS AND FUNCTIONS
Decision making with if statement, If….else statement, Switch statement, GOTO statement, The While and Do – While statements, For statement, Why Functions, Types of Functions, Multi functional program, Return values & their types
UNITIII **EMBEDDED SOFTWARE AND HARDWARE INTERFACING**
Kiel Compiler, Proteus, Interfacing of LED, Seven segment display, , LCD, Switches, Keyboard, Serial Communication, Sensors.
UNITIV INTRODUCTION TO IoT
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates
List of Experiments (At least SIX experiments needs to be performed) • Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:-character send and received, Read and display voltage • Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer • Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc. • Experiments using Seven Segment display. • Experiments using Temperature , IR, Finger print sensors. • Experiments with Raspberry Pi using LED. • Experiments on the applications of Buzzer, potentiometer. • Experiments on Interfacing with Bluetooth devices.

- Design and development of Arduino/Raspberry Pi based system for defined application/ projects.
- Getting started with the Arduino IDE: Serial Communication between Arduino board and PC:-character send and received, Read and display voltage .
- Experiments using single and multiple LEDs: Experiments on digital input and digital output on Arduino Uno board and using LED and Buzzer.
- Hands on experiments on Interfacing of the LDR,LCD: Experiment on LCD display:-Print numbers, Name, Time etc.
- Experiments using Seven Segment display.
- Experiments using Temperature , IR, Finger print sensors.
- Experiments with Raspberry Pi using LED.
- Interfacing of the LDR, IR sensors.
- Experiments on the applications of Buzzer, potentiometer.
- Design and development of Arduino/Raspberry Pi based system for defined application/ projects

Name of The Course	Linear Algebra and Differential Equations			
Course Code	BBS01T1003			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objective:

The objective of the course is familiarizing the prospective engineers with techniques in linear algebra and differential equations. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advanced level of Mathematics and application that they would find useful in their discipline.

Course Outcomes:

After successful completion of the courses, students will be able to:

CO1	Apply appropriate method to find inverse of a matrix and to solve system of linear equations. (K2, K3)
CO2	Understand and apply vector space and linear transformation and its matrix representation. (K1,K2, K3)
CO3	Apply the knowledge of eigen value and eigen vector, diagonalization, inner product spaces and orthogonalization for solving various problems.(K2,K3,K4).
CO4	Apply appropriate methods to solve nth order linear ordinary differential equations (K3,K4)
CO5	Classify partial differential equations and apply method of separation of variables to solve PDE.(K3,K4,K5)

Text Books:

- D. Poole, **Linear Algebra: A Modern Introduction,** 2nd Edition, Brooks/Cole, 2005.
- *Erwin Kreyszig*,**Advanced Engineering Mathematics,** 10th Edition, John Wiley & Sons.
- *Peter V. O'Neil,***Advanced Engineering Mathematics,** 7thEdition,Cengage Learning.

Reference Books:

- *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, Narosa Publishers.
- *Robert T. Smith and Roland B. Minton,* **Calculus**, 4thEdition,McGraw Hill Education.
- *David C Lay,* **Linear Algebra and its application,** 3rd Edition, Pearson Education.

Course Content:

Unit-1	**Contact Hours:6**
Basic Operations on matrices and vectors, Determinants, Cramer Rule, Inverse of matrix using Gauss Jordan elimination, Rank of a matrix, Solution of system of linear equations:Gauss elimination.	
Unit-2	**Contact Hours:10**
Vector Space, Linear Independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank, nullity, rank-nullity theorem, Inverse of a linear transformation, composition of linear maps, Matrix associated with a linear map.	
Unit-3	**Contact Hours: 9**
Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	
Unit-4	**Contact Hours: 9**
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, applications of linear differential equations.	
Unit-5	**Contact Hours: 8**
Basic concepts, Classification of second order linear PDE, Method of separation of variables and its application in solving Wave equation (one dimension), heat equation (one dimension) and Laplace equation (two dimension steady state only).	

Name of The Course	Introduction to Digital Systems			
Course Code	BEE01T1005			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	2	0	2	3

Course Objectives:

- *To familiarize with various Digital IC*
- *To understand basic fundamentals of Digital circuits..*
- *To prepare for various engineering applications.*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Solve the problems on Number system codes and their conversions.
CO2	Identify Digital IC and implement in the circuits.
CO3	Create, design and simulate canonical logic forms
CO4	Demonstrate the application of combinational and sequential logic circuits

Text Book (s)

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Digital Electronics	R P Jain	McGraw Hill	2017	Second
2	Digital Logic and Computer Design	Morris Mano	PHI	2017 review	Second
3	Digital Electronic Principles-	Malvino	PHI	2011-13	Seventh

Course Content:

Unit-I: Number Systems & Boolean Algebra

Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & non-weighted codes & code conversion, signed numbers, 1s and 2s complement codes, Binary arithmetic, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates. Logic families: TTL, ECL, CMOS.

Unit-II: Combinational Logic:

Switching equations(Mathematical operations), canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, mixed logic combinational circuits, multiple output functions, QuineMcluskey Methods for 5 variables.
Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers & De-multiplexer, binary adder, Subtractor, BCD adder, carry look ahead adder, Binary comparator, Arithmetic Logic Units.

Unit-III: Sequential Logic & Circuits:

Latch, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters counter design, Registers, types of registers. Analysis of simple synchronous sequential circuits

List of Experiment

- To study the basic logic gates
  - Verify their truth table.
  - Verification of De Morgan's Theorem.
- Verification Of SOP & POS Given Algebraic Expression Using Universal Gates.
- Designing of HALF and Full adder using basic logic gates.
- Design of 4:1 MULTIPLEXER USING GATES.
- Design and Implementation of 1-bit Magnitude Comparator using basic logic gates.
- Design and Verification of S-R Flip-Flop Circuits.
- Realization of 3-bit synchronous counter design For Various Application.
  - Frequency counters
  - Digital clock
  - Time measurement
- Project based learning: Building of LED Series / Seven Segment LED / Display unit.

Name of The Course	Introduction to Python Programing				
Course Code	BCS01T1005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

1. *This course helps to providestudentswithan introductiontoprogramming*
2. *It also explains the fundamental concepts of packages and data types*
3. *Introduce the concept of data visualisation using matplotlib and seaborn*

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Install and run the Python interpreter and understand the basics of python.
CO2	Create and execute Python programs
CO3	Implement functions, tuples and dictionaries.
CO4	Explore packages and implement programs.
CO5	Plot data with matplotlib libraries
CO6	Explore and implement data visualization

Text Book (s)

1.Python Programming using Problem Solving Approach by Reema Thereja, Oxford Publication.
2.Python Programming: An Introduction to Computer Science 2nd Edition by John Zelle

Reference Book (s):

1. Python Programming for the Absolute Beginner, 3rd Edition by Nicheal Dawson

Course Content:

Unit I: Introduction to Python and Computer Programming 8 lecture hours
Installing Python,Introuction to google colab,Data Types, Variables, Basic Input-Output Operations, Basic Operators.
Unit II: Boolean Values, Conditional Execution, Loops, Lists and List 8 lecture hours
Processing, Logical and Bitwise Operations,Making decisions in Python,Python's loops,Logic and bit operations in Python,Lists - collections of data, Sorting simple lists - the bubble sort algorithm, Lists - some more details, Lists in advanced applications.
Unit III: Functions, Tuples, Dictionaries, and Data Processing 8 lecture hours
Writing functions in Python,How functions communicate with their environment?,Returning a result from a function, Scopes in Python, Functions, Tuples and dictionaries
Unit IV: Modules, Packages, String and List Methods 8 lecture hours
Using modules,Some useful modules,What is package?Characters and strings Python's nature of strings,String methods

Unit V: Data Visualization using matplotlib	8 lecture hours
Data Visualization,Introduction to Matplotlib,Line Plot,Bar Chart,Histogram Plot,Box and Whisker Plot,Scatter Plot	
Unit-VI : Data Visualization using Seaborn	**8 lecture hours**
Visualizing Statistical Relationships,Plotting with Categorical Data,Visualizing the Distribution of a Dataset.	

Name of The Course	Digital Drawing			
Course Code	BME01T1003			
Prerequisite	Engineering Graphics and Introduction to Digital fabrication			
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	1	0	2	2

Course Objectives:

1. To enable students to use a modern CAD software package for solid modeling.
2. To draw 3D views of various machine elements.
3. To apply the knowledge of software package to model any chosen prototype.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1: Sketch solid models using basic commands.
CO2: Draw solid models of various machine elements.
CO3: Apply the knowledge of the Solid works software to model any chosen prototype.
CO4: Assemble the components of machine using reverse engineering concept

Text Book (s)

1. Matt Lombard, : Solidworks 2013 Bible", 2013, ISBN: 978-1-118-50840-4

Reference Book (s)

1.Greg Jankowski, Richard Doyle, "SolidWorks For Dummies", 2nd Edition, 2011 ISBN: 978-1-118-05147-4

	Unit	**Unit Topics**
Week 1(2Hours)	**1.Introduction to SOLIDWORKS**	• Introduction to SOLIDWORKS 2016 • Getting Started with SOLIDWORKS • Menu Bar and SOLIDWORKS Menus • Command Manager • Toolbar • Dimensioning Standard and Units • Important Terms and Their Definitions • Hot Keys • Color Scheme

Week 1 (2Hours)	**2. Drawing Sketches for Solid Models**	• The Sketching Environment • Starting a New Session of SOLIDWORKS 2016 • Task Panes • Starting a New Document in SOLIDWORKS 2016 • Understanding the Sketching Environment • Setting the Document Options • Learning Sketcher Terms • Drawing Sketch Entities • Drawing Display Tools • Deleting Sketched Entities
Week2(2Hours)	**3. Editing and Modifying Sketches**	• Editing Sketched Entities • Creating Patterns • Editing Patterns • Writing Text in the Sketching Environment • Modifying Sketched Entities
Week2(2Hours)	**4. Adding Relations and Dimensions to Sketches**	• Applying Geometric Relations to Sketches • Design Intent • Dimension a Sketch • Concept of a Fully Defined Sketch • Deleting Over defined Dimensions • Opening an Existing File
Week3(2Hours)	**5. Advanced Dimensioning Techniques and Base Feature Options**	• Advanced Dimensioning Techniques • Measuring Distances and Viewing Section Properties • Creating Base Features by Extruding Sketches • Creating Base Features by Revolving Sketches • Determining the Mass Properties of Parts • Dynamically Rotating the View of a Model • Modifying the View Orientation • Restoring the Previous View • Displaying the Drawing Area in Viewports • Display Modes of a Model • Additional Display Modes • Assigning Materials and Textures to Models
Week3(2Hours)	**6. Creating Reference Geometries**	• Importance of Sketching Planes • Reference Geometry • Advanced Boss/Base Options • Modeling Using the Contour Selection Method • Creating Cut Features • Concept of Feature Scope

Week 4 (2Hours)	**7. Advanced Modeling Tools-I**	• Creating Simple Holes • Creating Standard Holes Using the Hole Wizard • Adding External Cosmetic Threads • Creating Fillets • Selection Options • Creating Fillets Using the FilletXpert • Creating Chamfers • Creating Shell Features • Creating Wrap Features
Week 4	**8. Advanced Modeling Tools-II**	• Creating Mirror Features • Creating Linear Pattern Features • Creating Circular Pattern Features • Creating Sketch Driven Patterns • Creating Curve Driven Patterns
Week 5		• Creating Table Driven Patterns. • Creating Fill Patterns • Creating Variable Patterns • Creating Rib Features • Displaying the Section View of a Model • Changing the Display States
Week 5 (2Hours)	**9. Editing Features**	• Editing Using the Edit Feature Tool • Editing Sketches of the Sketch-based Features • Editing the Sketch Plane Using the Edit Sketch Plane Tool • Editing Using the Instant3D Tool • Editing Features and Sketches byUsing the Cut, Copy, and Paste Options • Cutting, Copying, and Pasting Features and Sketches fromOne Document to the Other • Copying Features Using Drag and Drop • Deleting Features • Deleting Bodies • Suppressing Features • Unsuppressing the Suppressed Features • Unsuppressing Features with Dependents • Hiding Bodies • Moving and Copying Bodies • Reordering the Features • Rolling Back the Feature • Renaming Features • Creating Folders in the FeatureManager Design Tree • What's Wrong Functionality
Week 6	**10. Advanced Modeling Tools-III**	• Creating Sweep Features • Creating Cut-Sweep Features • Creating Loft Features • Adding a Section to a Loft Feature • Creating Lofted Cuts

Week 6		• Creating 3D Sketches • Creating Grid Systems • Editing 3D Sketches • Creating Curves • Extruding a 3D Sketch • Creating Draft Features
Week 7	**11. Advanced Modeling Tools-IV**	• Advanced Modeling Tools • Creating Fastening Features • Creating Freeform Features • Dimensioning a Part Using DimXpert
Week 7	**3D Modelling Project**	• Use the concept of Reverse Engineering and Redesign the parts by measuring them using the Measuring Instrument
Week 8	**3D Modelling Project**	• Use the concept of Reverse Engineering and Redesign the parts by measuring them using the Measuring Instrument
Week 8 (2Hours)	**12. Assembly Modeling-I**	• Assembly Modeling • Creating Bottom-up Assemblies • Creating Top-down Assemblies • Moving Individual Components • Rotating Individual Components • Moving and Rotating Individual Components Using the Triad • Assembly Visualization
Week 9 (2Hours)	**13. Assembly Modeling-II**	• Advanced Assembly Mates • Mechanical Mates • Creating Sub-assemblies • Deleting Components and Sub-assemblies • Editing Assembly Mates • Editing Components • Editing Sub-assemblies • Dissolving Sub-assemblies • Replacing Components
Week 9 (2Hours)		• Creating Patterns of Components in an Assembly • Copying and Mirroring Components • Copying a Component along with Mates • Simplifying Assemblies using the Visibility Options • Checking Interferences in an Assembly • Checking the Hole Alignment • Creating Assemblies for Mechanism • Creating the Exploded State of an Assembly

Week 10 (2Hours)	**14. Working with Drawing Views-I**	• The Drawing Mode • Starting a Drawing Document • Types of Views • Generating Standard Drawing Views • Generating Derived Views • Working with Interactive Drafting in SOLIDWORKS • Editing and Modifying Drawing Views • Modifying the Hatch Pattern in Section Views
Week 10 (2Hours)	**15. Working with Drawing Views-II**	• Adding Annotations to Drawing Views • Adding the Bill of Materials (BOM) to a Drawing • Linking Bill of Materials • Adding Balloons to the Drawing Views • Adding Balloons Using the AutoBalloon Tool • Creating Magnetic Lines • Adding New Sheets to the Drawing Views • Editing the Sheet Format • Creating User-Defined Sheet Formats
Week 11 (2Hours)	**16. Surface Modeling**	• Creating an Extruded Surface • Creating a Revolved Surface • Creating a Swept Surface • Creating a Lofted Surface • Creating a Boundary Surface • Creating a Planar Surface • Creating a Fill Surface • Creating a Radiated Surface • Offsetting Surfaces, Trimming Surfaces • Untrimming Surfaces
Week 11 (2Hours)		• Extending Surfaces, Knitting Surfaces ,Filleting Surfaces • Creating a Mid-Surface, Deleting Holes from Surfaces • Replacing Faces, Deleting Faces • Moving and Copying Surfaces • Mirroring Surface Bodies • Adding Thickness to Surface Bodies • Creating a Thicken Surface Cut, Creating a Surface Cut
Week 12 (4Hours) +	**3D Modeling, Assembly and Drafting Project** **(Minimum 10 parts)** **Project Display**	• Use the concept of Reverse Engineering and Redesign the parts by measuring them using the Measuring Instrument • Creating Assemblies of parts created earlier • Drafting of the assembly model created • Student needs to demonstrate his project

Name of The Course	Creativity, Innovation and Entrepreneurship				
Course Code	BLEUCT1003				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	1	0	2	2	

Course Objectives:

1. To make students aware of the need of self-earning system.
2. To develop interest in creative business ideas.
3. To make them capable of becoming entrepreneurs.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Identify the social and economic problems in strategic way and develop creative design thinking and its approach
CO2	Discover the self-potential and skills to effectuate the idea of solving a problem
CO3	Identify the consumers and market to the idea
CO4	Propose a solution in form of product and evaluate the risks

Reference Book (s):

- Stay Hungry Stay Foolish, Rashmi Bansal, Westland, 2008.
- Sahlman, William A. "Some Thoughts on Business Plans." Chap. 9 in *The Entrepreneurial Venture*. 2nd ed. by William A. Sahlman, Howard H. Stevenson, Michael J Roberts, and Amar V. Bhide, 138–176. Harvard Business School Press, 1999.
- Ronstadt R, Robert R. Entrepreneurship: Text, cases and notes. Dover, MA: Lord Publishing; 1984.
- Steyaert C, Dey P. 1. The books on social entrepreneurship we edit, critique and imagine. Social Entrepreneurship: An Affirmative Critique. 2018 Mar 30:1.
- Harrison RT, Leitch CM, editors. Research handbook on entrepreneurship and leadership. Edward Elgar Publishing; 2018 Jan 26.
- Kuratko DF. Entrepreneurship: Theory, process, and practice. Cengage Learning; 2016 Jan 8.

Unit- 1:	**6 hours**
Problem Discussion and Idea generation, Discussion Strategies, What is Idea Generation? – Definition, Techniques and Success Factors, Innovation management, Tools and techniques for generating ideas, Types of idea challenges**.** Problem Classification: Problem Identification, Classification, Resources, Facilities, Idea of solution, Proof of concept. Design Thinking , Understand Design Thinking as a problem solving process, Describe the principles of Design Thinking, Describe the Design Thinking process **Activity: (i)** Identification of a social problem its classification and existing solution (ii) Applying Design Thinkingto a problem worth solving with design thinking steps	
Unit-2:	**4 hours**
Self Discovery and Effectuation: Effectuation principles, Entrepreneurship Styles, Case studies and success stories to draw the difference. **Activity:** (i) Finding your flow (ii)Entrepreneurship styles quiz (M1 to M5 activity)	

Unit-3:	**6 hours**
Customer and solution: Concept of consumer and customer, Market types, Influence of market types, Activity for the students to identify market types based on product and services. Market segmentation and targeting, Criteria for evaluating market segments. **Activity:** Identify your market type	
Unit-4:	**8 hours**
Value Proposition Lean canvas template, Business model canvas, Value Proposition Canvas, Identifying risky assumptions, Prioritising your risk assumptions, Seeking external advice to calibrate your risks. Validation, Refine unique value proposition, Blue ocean strategy **Activity:** (i) Identify the problem, solution and customer segment of existing companies (ii) Identify what is your customer segment, customer jobs, gains, and pains. (iii) Identify your blue ocean strategy.	

Name of The Course	Creative and Liberal Arts			
Course Code	BLEUCT1002			
Prerequisite	NA			
Corequisite	NA			
Antirequisite	NA			
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

Course aims to prepare open-minded, creatively engaged, and culturally aware people to live and play together. Students must show an interest in the liberal arts either by majoring in an artistic field or the humanities (art, English, film, music, theatre, philosophy, political science, history, etc.) or by simply enjoying and getting involved in the arts. Course is designed to generate an atmosphere for students to express and explore the liberal arts, creativity, and artistic interests or skills.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Foster a respect and appreciation for art as a mutual space for communication.
CO2	Understand and respect other perspectives, and promote others artistic endeavors.

Text Book (s)

- Mark Baskinger, William Bardel (2013), Drawing Ideas: A Hand-Drawn Approach for Better Design, Watson-Guptill publication (ebook).
- Paul Klee, Paul Findlay (1966), On Modern Art, Faber & Faber publication, London
- Writing Essays For Dummies' by Mary Page and Carrie Winstanley
- Stuart Carey (2019), From Clay to Kiln, Book Authority publication
- https://chrisoatley.com/how-to-write-a-comic-book-script/

Additional References

- WHAT IS Modern and Contemporary Art?https://imma.ie/wp-content/uploads/2018/10/whatismodernandcontemporaryartmay2010.pdf
- Poetic Devices (Definitions with Examples) and Rhyme-http://dg099.k12.sd.us/12B/Shared%20Documents/poetry%20devices.pdf
- Reading Film as Complex Text Angela Orr EianGilbert https://www.washoeschools.net/cms/lib/NV01912265/Centricity/Domain/253/Social%20Studies/Reading%20Film%20as%20Complex%20Text.pdf

Name of The Course	Environmental Science				
Course Code	BCEUCT1003				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	1	0	4	3	

Course Objectives:

- Demonstrate various methods of water treatment for domestic and industrial purpose.
- Explanation of different types of batteries and its commercial applications
- Demonstration and familiarization of impact of waste on environmental degradation.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand various methods of water treatment for domestic and industrial use
CO2	Differentiate various categories of waste and its disposal techniques
CO3	Identify various batteries and recognize its commercial applications
CO4	Understand different tools of Green Chemistry towards generating a zero waste environment
CO5	Apply the knowledge of environmental pollution and degradation to solve related problems

Text Book (s)

- Text Book of Engineering Chemistry, S. S. Dara, S. Chand & company,2013, 11th Edition
- Engineering Chemistry, Jain &Jain, Dhanpatrai&Dhanpatrai,2015,sixteenth edition
- A Test Book of Environmental Chemistry & Pollution Control, S.S. Dara, S. Chand & Co., 2006, 11th edition
- Environmental Studies, Ranu Gadi, Sunita Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s):

- Environmental Chemistry, B.K. Sharma & H. Kaur, Goel Publishing House,2014, 14th edition.
- Environmental Studies, R. Rajgopalan, Oxford Publication,2016, 3rd edition.
- Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.

E-Book (s) :

- Water purification, Alexandru Grumezescu, First edition.
- Solid waste management by Stephen Burnley, Willey publication,2014
- Air Pollution, S. K. Agarwal, APH Publishing, 2005

Unit-1 Water Technology	**6 hours**
Purification of Domestic water, Boiler troubles, softening methods of industrial water.	
Solid Waste Management and treatment Technology:	**4 hours**
Introduction to E-Waste, Biomedical waste and Solid waste. Treatment: Collection, segregation, transportation and its disposal techniques	

Battery Technology & Sustainable Energy Sources:	**4 hours**
Introduction to Battery, reversible and irreversible batteries. Examples: Lead-acid battery, Nickel-Cadmium Battery, Lithium ion battery and fuel cell Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas.	
Unit-4 Green Chemistry	**4 hours**
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.	
Unit-5 : Environmental Pollution & Current Environmental Issues:	**4 hours**
Air pollution- Urban air quality standards as per WHO, its sources and controlling methods. Water pollution- water quality index as per WHO, its sources and controlling methods, Climate Change and Global warming: Effects, Acid Rain, Ozone Layer depletion, Photochemical Smog,	

Name of The Course	Alexa Skilling				
Course Code	BCS01T1007				
Prerequisite	NA				
Corequisite	NA				
Antirequisite	NA				
	L	**T**	**P**	**C**	
	0	0	2	2	

Course Objectives:

- To introduce the student to the idea of voice assistant devices
- To provide a foundation to create alexa skills

Course Outcomes:

After successful completion of the course, students will be able to:

CO1	Understand the basic concepts of Alexa
CO2	Understand Alexa Skill Set
CO3	Design an engaging Voice User Interface
CO4	Setting Up AWS
CO5	Create alexa skills.

Text Book (s)

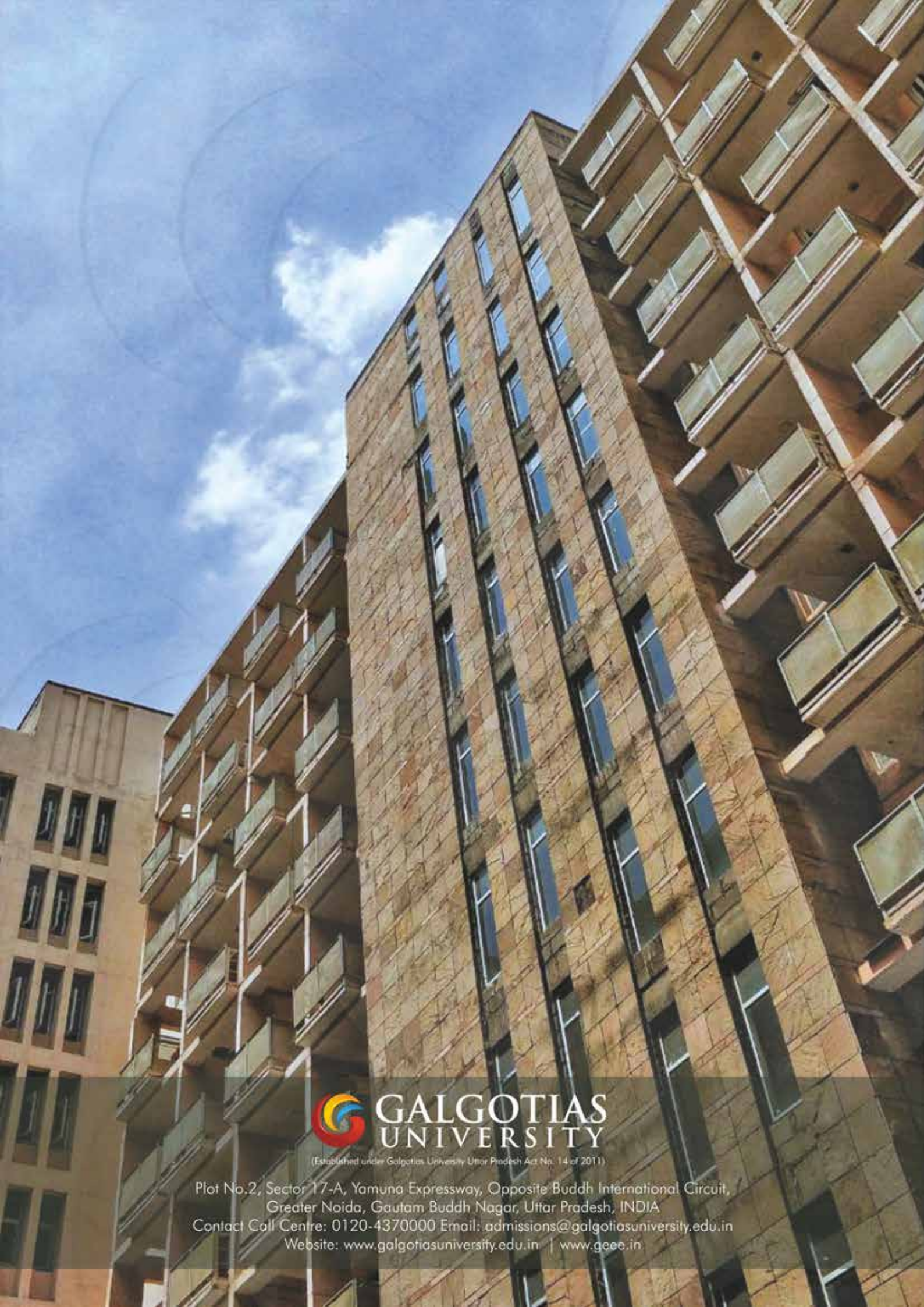
- Build your own Alexa skill by Andrew Odewahn, Brian Jepson Publisher(s): O'Reilly Media, Inc.ISBN: 9781491974650
- Alexa Skills Projects, By Madhur Bhargava, Packt

Reference Book (s):

- Hands-On Chatbot Development with Alexa Skills and Amazon Lex,Sam Williams ,Packt

Unit 1:Introduction to Alexa : Intro to Alexa , The future of voice-based experiences , Overview of Echo, Alexa.
Unit 2:Alexa Skill Set
Build Alexa Skills, Why you should build Alexa skills, What type of Alexa skills you can create, How an Alexa skill works, The steps to build a skill, The requirements to build a skill.

Unit 3:Design an Engaging Voice User Interface
How users interact with Alexa, Voice design concepts: utterances, intents, slots, interaction model and situational design, Characteristics of a well-designed voice user interface (VUI), Key challenges of voice design.
UNIT4:Setting up AWS
Setting Up Your Alexa Skill in the Developer Portal , Setting Up A Lambda Function Using Amazon Web Services, Connecting Your Voice User Interface To Your Lambda Function.
Unit 5 : Creating alexa skills: Fact Skill,Quiz Skill & Project on Alexa Skill
Unit-6 AI in Practice
Visualizing Statistical Relationships, Plotting with Categorical Data, Visualizing the Distribution of a Dataset.



GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

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