GALGOTIAS UNIVERSITY

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

School of Computing Science and Engineering

Program: B.Sc (Computer Science)

Scheme: 2018/2019 – 2022

Curriculum

Semester 1

Sl. No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BSCS1110	Discrete Mathematics	3	1	0	4	20	50	100
2	BSCS1120	Computer System Organization	3	0	0	3	20	50	100
3	BSCS1130	Computer Programming using ‘C’	3	0	0	3	20	50	100
4	PHYS1011	Applied Physics	3	0	0	3	20	50	100
5	BSCS1131	Computer Programming using ‘C’ Lab	0	0	2	1	50	-	50
6	BSCS1141	Computer System Organization Lab	0	0	2	1	50	-	50
7	JAPA1001	Japanese-I	0	0	2	1	50	-	50
8	SLBC1001	Basic English	0	0	4	2	50	-	50
		Total	**12**	**1**	**10**	**18**			

Semester II

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	EVS 101	Environment Studies	2	1	0	3	20	50	100
2	BSCS1210	Numerical Methods for Problem solving	3	0	0	3	20	50	100
3	BSCS1220	Data Structure and Algorithms	3	0	0	3	20	50	100
4	BSCS1230	Operating Systems	3	0	0	3	20	50	100
5	BSCS1240	Object Oriented Programming with C++	3	0	0	3	20	50	100
6	BSCS1260	Introduction to Data Science	3	0	0	3	20	50	100
7	BSCS1221	Data Structures and Algorithms Lab	0	0	2	1	50	-	50
8	BSCS9011	iOS, Android APP Development Lab	0	0	4	2	50	-	50
9	BSCS1241	Object Oriented Programming with C++ Lab	0	0	2	1	50	-	50
10	BSCS1251	Application oriented programming using Python	0	0	4	2	50	-	50
11	SLBC1002	Professional Communication	0	0	4	2	50	-	50
12	JAPA1002	Japanese-II	0	0	2	1	50	-	50
		Total	**19**	**1**	**16**	**28**			

Semester III

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BSCS2310	Engineering Economics and Management	3	0	0	3	20	50	100
2	BSCS2320	Database Management System	3	0	0	3	20	50	100
3	BSCS2330	Java Programming	3	0	0	3	20	50	100
4	BSCS2340	Computer Graphics	3	0	0	3	20	50	100
5	BSCS2350	Design and Analysis of Algorithms	3	0	0	3	20	50	100
6		Elective-I	3	0	0	3	20	50	100
7	LLL235	Aptitude Building	0	0	4	2	50	-	50
8	BSCS2321	Database Management System Lab	0	0	2	1	50	-	50
9	BSCS2331	Java Programming Lab	0	0	2	1	50	-	50
10	BSCS2341	Computer Graphics Lab	0	0	2	1	50	-	50
11	BSCS2351	Design and Analysis of Algorithms Lab	0	0	2	1	50	-	50
12	JAPA2003	Japanese-III	0	0	2	1	50	-	50
		Total	**18**	**0**	**14**	**25**			

Semester IV									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BSCS2460	Artificial Intelligence and Machine Learning	3	0	0	3	20	50	100
2	BSCS2470	Cryptographic and Network Security	3	0	0	3	20	50	100
3	BSCS2430	Computer Networks	3	0	0	3	20	50	100
4	BSCS2440	Software Engineering	3	0	0	3	20	50	100
5	BSCS2450	Internet and Web Technology	3	0	0	3	20	50	100
6		Elective-II	3	0	0	3	20	50	100
7	LLL245	Campus-to-Corporate	0	0	4	2	50	-	50
8	BSCS2461	Artificial Intelligence and Machine Learning using Python Lab	0	0	4	2	50	-	50
9	BSCS2471	Cryptographic and Network Security Lab	0	0	2	1	50	-	50
10	BSCS2431	Computer Networks Lab	0	0	2	1	50	-	50
11	BSCS2441	Software Engineering Lab	0	0	2	1	50	-	50
12	BSCS2451	Internet and Web Technology Lab	0	0	2	1	50	-	50
		Total	**18**	**0**	**16**	**26**			

Semester V									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BSCS3510	Open Source Technologies	3	0	0	3	20	50	100
2	BSCS3520	Advances in Databases	3	0	0	3	20	50	100
3	BSCS3530	Data Mining and Data Warehousing	3	0	0	3	20	50	100
4	BSCS3540	Object Oriented Analysis and Design	3	0	0	3	20	50	100
5	BSCS3550	Microprocessor and Microcontroller	3	0	0	3	20	50	100
6	BSCS3560	Linux Administration	3	0	0	3	20	50	100
7		Elective-III	3	0	0	3	20	50	100
8	BSCS3511	Open Source Lab	0	0	2	1	50	-	50
9	BSCS3521	Advances in Databases Lab	0	0	2	1	50	-	50
10	BSCS3541	Object Oriented Analysis and Design Lab	0	0	2	1	50	-	50
11	BSCS3551	Microprocessor and Microcontroller Lab	0	0	2	1	50	-	50
12	BSCS3561	Linux Administration Lab	0	0	2	1	50	-	50
13	BSCS3571	Project Work – 1	0	0	0	5	50	-	50
		Total	**21**	**0**	**10**	**31**			

Semester VI									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BSCS3611	Project Work-2	0	0	30	15	50	-	50
		TOTAL	**0**	**0**	**30**	**15**			

List of Electives

Bucket-1

Sl No	Course Code	Name of the Electives (Choose one)					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BSCS3001	Human Computer Interaction	3	0	0	3	20	50	100
2	BSCS3002	Big Data Technology	3	0	0	3	20	50	100
3	BSCS3003	Introduction to Cyber Security	3	0	0	3	20	50	100

Bucket-2

Sl No	Course Code	Name of the Electives (Choose one)					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BSCS4001	Cloud Computing	3	0	0	3	20	50	100
2	BSCS4002	Distributed Systems	3	0	0	3	20	50	100
3	BSCS4003	Operational Research for Computer Science	3	0	0	3	20	50	100

Bucket-3

Sl No	Course Code	Name of the Electives (Choose one)					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BSCS5001	Disruptive Technology	3	0	0	3	20	50	100
2	BSCS5002	Software Project Management	3	0	0	3	20	50	100
3	BSCS5003	Internet of Things	3	0	0	3	20	50	100

Detailed Syllabus

Name of The Course	Discrete Mathematics				
Course Code	**BSCS1110**				
Prerequisite	Basic knowledge of Mathematical function				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	1	0	4

Course Objectives:

1. Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:
2. Use mathematically correct terminology and notation.
3. Construct correct direct and indirect proofs.
4. Use division into cases in a proof.
5. Apply logical reasoning to solve a variety of problems.

Course Outcomes:

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

CO1	Understand the concept of mathematical logic and mathematical induction.
CO2	Learning the concept of Combinatorics and Stack and their applications.
CO3	Apply the mathematical knowledge to solve the recurrence relations.
CO4	Understanding the concept of Graph and their applications.
CO5	Understanding the concept of Boolean algebra their applications**.**

Text Books:

1. J.L. Mott, A. Kandelad T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, PHI, 2nd Edition, 1999.

Reference Books:

2. J.P. Trembley and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill – 13th reprint 2001.

Course Content:

Unit I: Mathematical Logic **8 hours** Introduction – Propositions – Connectives – Truth tables – Tautologies and Contradictions – Equivalences implications – Normal forms – Methods of proof rules of inference for quantified propositions – Mathematical induction.
Unit II: Combinatorics **8 hours** Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Basics of counting – Combinations of permutations – Enumeration of combination and permutation – Pigeonhole principle – Inclusion – Exclusion principle – Ordered and unordered portions.
Unit III: Recurrence Relations **8 hours** Generating function of sequences – Calculating coefficients of generating functions – Recurrence relations – Solving recurrence relations by substitutious and generating functions – Method of characteristic roots – Solution of homogenous recurrence relations.
Unit IV: Graph Theory **8 hours** Basic concepts of graph theory – Diagraph – Paths – Reachability connectedness – Matrix representation of graphs – Subgraphs – Isomorphisms trees – Properties – Directed tress – Binary trees.

Unit V: Boolean Algevra **8 hours** Post – Hasse diagrams – Lattices – Types of Lattices – Boolean Algebra – Basic theorems – Applications.

Continuous Assessment Pattern:

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Computer System Organization				
Course Code	BSCS1120				
Prerequisite	Fundamental of Computers				
Corequisite					
Antirequisite					
	L	T	P	C	
	3	0	0	3	

Course Objectives:

1. Discuss the basic concepts and structure of computers.
2. Understand concepts of register transfer logic and arithmetic operations.
3. Explain different types of addressing modes and memory organization.
4. Learn the different types of serial communication techniques.
5. Summarize the Instruction execution stages

Course Outcomes:

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

CO1	Understand the basic organization of computer and different instruction formats and addressing modes.
CO2	Analyze the concept of pipelining, segment registers and pin diagram of CPU.
CO3	Understand and analyze various issues related to memory hierarchy.
CO4	Evaluate various modes of data transfer between CPU and I/O devices.
CO5	Examine various inter connection structures of multi processors.

Text Books:

1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman / Elsevier, Fifth edition, 2014.

Reference Books:

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition,Mc Graw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture" , Seventh Edition , Pearson Education,2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition,Pearson Education, 2005
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.

Course Content:

Unit I: Overview & Instructions **9 hours** Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.
Unit II: Arithmetic Operations **9 hours** ALU – Addition and subtraction – Multiplication – Division – Floating Point operations.
Unit III: Processor And Control Unit **9 hours** Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.
Unit IV: Parallelism **9 hours** Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors.

Unit V: Memory And I/O Systems **9 hours**

Memory hierarchy – Memory technologies – Cache basics – Measuring and improving cache performance – Virtual memory, TLBs – Input/output system, programmed I/O, DMA and interrupts,I/O processors.

Continuous Assessment Pattern:

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Computer Programming using 'C'				
Course Code	**BSCS1130**				
Prerequisite	Fundamental of Computers				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

The course aims to provide exposure to problem-solving through programming. It aims to train the student to the basic concepts of the C-programming language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcomes:

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

CO1	Identify situations where computational methods and computers would be useful.
CO2	Given a computational problem, identify and abstractthe programming task involved.
CO3	Approach the programming tasks using techniques learned and write pseudo-code.
CO4	Choose the right data representation formats based on the requirements of the problem.
CO5	Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
CO6	Write the program on a computer, edit, compile, debug, correct, recompile and run it.
CO7	Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

Text Books:

1. Gottfried, Byron S., Programming with C, Tata McGraw Hill
2. Balagurusamy, E., Computing Fundamentals and C Programming, Tata McGraw-Hill

Reference Books:

1. Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.
2. Yashwant Kanetker, Let us C, BPB
3. Rajaraman, V., Computer Programming in C, PHI

Course Content:

Unit I: Introduction **8 hours** Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.
Unit II: C Programming Basics **10 hours** Problem formulation – Problem Solving - Introduction to ' C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.
Unit III: Arrays And Strings **9 hours** Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.
Unit IV: Functions And Pointers **9 hours** Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.
Unit V: Structures And Unions **9 hours**

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

Continuous Assessment Pattern:

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Applied Physics				
Course Code	PHYS1011				
Prerequisite	Physics				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. An ability to apply profound understanding of Quantum Mechanics and its applications.
2. An understanding of free electron gas model
3. An ability to design a Laser system and its component, or process to meet desired needs within realistic constraints such as health and safety, manufacturability
4. The broad education necessary to understand special theory of relativity.
5. A knowledge of upcoming technologies like photonics

Course Outcomes:

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

CO1	Students would be able to describe the Quantum Mechanics and its applications.
CO2	Students would be able to write down the band theory of Solids.
CO3	To enable student to learn and to apply concepts learnt in Quantum optics in Industry and in real life.
CO4	To enable students to learn the idea of **Global Positioning System (GPS)** and to explore its further applications and importance in advancement of technologies
CO5	To identify the applications of electrodynamics using Maxwell equations

Text Books:

1. Kanaan kano , semiconductor devices , PHI, 2005
2. S.O. Pillai, Solid state physics , New Age International Pvt Ltd, 7th edition, 2015.
3. Arthur Beiser, S Rai Choudhury, Shobhit Mahajan, (2009), Concepts of Modern Physics, 6th Edition, Tata-McGraw Hill. ISBN- 9780070151550..
4. M. Morris Mano, Digital Design, Pearson Education; 5th edition , 2014

Reference Books:

1. D.A. Neamen , Semiconductor physics and devices .3rd edition , Mcgraw-Hill, 2003.
2. M.S . Tyagi , Introduction to semiconductor materials and devices , John Wiley & Sons, 2004.
3. B.B. Laud, Lasers and Non-Linear Optics (2011), 3rd Edition, New Ages International.
4. William Silfvast (2002), Laser Fundamentals, Cambridge University Press.

Course Content:

Unit I: Semiconductor fundamentals **8 hours** Intrinsic and extrinsic semiconductors, elemental and compound semiconductor, carrier concentration and Fermi level of intrinsic and extrinsic semiconductor, thermal effects, conductivity and carrier mobility in semiconductors.
Unit II: Junction Theory and diodes **8 hours**

PN junction , junction potential , biasing of PN junction , I-V characteristics , static and dynamics resistances , breakdown phenomena- avalanche and Zener process, Zener diode and applications of diode.

Unit III: Number system and Boolean algebra **8 hours**

Decimal/Binary/Octa/Hexa number system and conversions, Basic theorem and properties of Boolean algebra, Logic operations and gates, Adder and subtractor, comparator.

Unit IV: Optics **8 hours**

Snell's Law, Total Internal reflection , graded index, Interference- Interference of Light, Division of wavefronts: amplitude, interference in thin films, Newton's rings; Diffraction-Single slit, Diffraction grating, Grating spectra, Rayleigh's criterion and resolving power of grating.

Unit V: Laser **8 hours**

Einstein's coefficients, Population Inversion, Three level and four level laser, Laser characteristics, He-Ne laser and applications.

Continuous Assessment Pattern:

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Computer Programming using 'C' Lab				
Course Code	**BSCS1131**				
Prerequisite	C Language				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

This course emphasizes the nature of C language using many applications and helps to understand the need to choose the language for solving the problem. The students can understand the art of computer programming.

List of Experiments:

1. C Programming using Simple statements and expressions
2. Scientific problem solving using decision making and looping.
3. Simple programming for one dimensional and two dimensional arrays.
4. Solving problems using String functions
5. Programs with user defined functions – Includes Parameter Passing
6. Program using Recursive Function and conversion from given program to flow chart.
7. Program using structures and unions.

Text Books:

1. Gottfried, Byron S., Programming with C, Tata McGraw Hill
2. Balagurusamy, E., Computing Fundamentals and C Programming, Tata McGraw-Hill

Reference Books:

1. Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.
2. Yashwant Kanetker, Let us C, BPB
3. Rajaraman, V., Computer Programming in C, PHI

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Computer System Organization Lab				
Course Code	BSCS1141				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

This course is designed to provide a comprehensive introduction to digital logic

1. Design leading to the ability to understand number system representations, binary codes, binary arithmetic and Boolean algebra, its axioms and theorems, and its relevance to digital logic design.
2. To Analyze and design simple systems composed of programmable logic, such as
3. ROMs and PLAs. Aiming at conducting Tutorial, seminars and remedial classes.

Course Outcomes:

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

CO1	Demonstrate knowledge of binary number theory, Boolean algebra and binary codes
CO2	Analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps).
CO3	Analyze and design combinational systems composed of standard combinational modules, such as multiplexers flip-flops, demultiplexer and decoders.
CO4	Demonstrate knowledge of simple synchronous sequential systems
CO5	Analyze and design sequential systems composed of standard sequential modules, such as counters and registers.
CO6	Analyze and design simple systems composed of programmable logic, such as ROMs and PLAs
CO7	Perform basic arithmetic operations with signed integers represented in binary

List Of Experiments:

1. Study the basic architecture of computer system and ALU operations.
2. Study the memory and I/O system of Computer.
3. Study the processor and control unit function.
4. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along with examples.
5. Write the working of 8085 simulators GNUsim8085 and basic architecture of 8085 along with small introduction.
6. Write an assembly language code in GNUsim8085 to add two numbers.
7. Write an assembly language code in GNUsim8085 to add n consecutive numbers.
8. Write an assembly language code in GNUsim8085 to count the numbers of 1's.
9. Write an assembly language code in GNUsim8085 to implement multiply two 8 bit numbers without shifting.
10. Write an assembly language code in GNUsim8085 to addition of two numbers using lxi.
11. Write an assembly language code in GNUsim8085 to find the smallest and largest number from the given serives.
12. Write an assembly language code in GNUsim8085 to find the factorial of a number.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	**JAPANESE-I**				
Name of the Course	**JAPANESE-1**				
Course Code	**JAPA1001**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

1. This course attempts to give the students working knowledge of Japanese Language with emphasis on communicative competence.
2. This course will focus on listening and speaking.
3. Basic Japanese sentences will be introduced and practiced.
4. Sufficient vocabulary will be given to the students to converse in different situations using the language patterns taught.
5. Introduction to Japanese history, politics, culture and society will be given.
6. This course aims to give the students an interdisciplinary approach in order to compete in the globalized world.
7. This course will expose the students to a new culture which promotes respect for the 'others' and inculcates tolerance.

Course Outcomes:

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

CO1	On the completion of the course, the students will be able to understand simple Japanese and answer question in Japanese.
CO2	They will be able to introduce themselves in Japanese and talk on simple topics such as 'My family', 'My city' etc.
CO3	They will have a basic understanding of Japanese society and culture.

Text Books:

1. Shokyuu Nihongo, Japanese Language Center for International Students, Tokyo University of foreign Studies, Japan.
2. Nihongo Kana nyuu mon, Japan foundation, Japan.
3. Shin Nihongo no KISO-1, AOTS, 3A Corporation, Japan.

Reference Books:

1. Random House Japanese-English Dictionary
2. Japanese for Busy people, Video CD, AJALT, Japan.

Course Content:

Unit I: Introduction to Japanese syllabary, Vowels and Consonants, Romaji, Hiragana, Katakana, Japanese Numerals, Demonstrative pronouns, Greetings, Set phrases – One gaishimasu – Sumimasen, wakarimashita Parts of body (look and learn)
Unit II: 1. 1.Hajimemashite. **2.** 2.Hon no Kimochi.
Unit III: 1. 3.kore wo kudasai. 2. 4.Sochira wa nanjikara nanji made desu ka.

3. 5.Kooshi en e ikimasu ka. 4. 6.Issho ni ikimasen ka.
Unit IV: 1. 5.Kooshi en e ikimasu ka. 2. 6.Issho ni ikimasen ka.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	BASIC ENGLISH				
Course Code	SLBC1001				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	4	2

Text Books:

1. Compiled and prepared by English Division, SSH, VIT

Reference Books:

1. Developing Communication Skills by Krishna Mohan & Meera Banerji
2. Communication Skill for you by Dharmendra Mittal

Course Content:

Unit I: Reading Writing Level 1 **8 hours** Listening: Identifying the key words Reading and Writing: Textual Essay: Advertising Letter Writing: Informal letters Functional Grammar: Basics of grammar Vocabulary: Identifying jumbled letters and framing sentences
Unit II: Reading Writing Level 2 **8 hours** Listening: Conversations Reading and Writing: Textual Essay: Art of Listening Letter Writing: Permission Letters Functional Grammar: Tenses Vocabulary: Commonly used phrasal verbs.
Unit III: Reading Writing Level 3 **8 hours** Listening: Listening to songs and answering multiple choice questions Reading and Writing: Textual Essay: An Astrologer's Day Letter Writing: To the editor Functional Grammar: Active and Passive voice Vocabulary: Prefix and Suffix
Unit IV: Laboratory **8 hours** English Master- Exercises 1-10, Cambridge Advanced Learners' Dictionary.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	-	50	100

Name of The Course	Environment Studies				
Course Code	EVS101				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		2	1	0	3

Course Objectives:

1. The students will understand the objective of environmental studies and importance of natural resources conservation.
2. The will realize the effect of toxic chemicals available in the environment. The students will learn about the sources, effects and control measures of air, water, soil, noise, thermal pollution. They will also be made aware of natural disaster management.
3. The students will understand the need of sustainable development, environment laws, role of information technology in the environment.
4. The students will be explained basic principles of green Chemistry and concept of atom economy.

Course Outcomes:

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

CO1	Identify the scope and importance of studying the environment and analyze the problems associated with various natural resources.
CO2	Determine the harmful effects of toxic chemicals on living beings and environment.
CO3	Identify the harmful effects of environmental pollution and apply suitable control methods.
CO4	Analyze the different social issues affecting the society and environment
CO5	Interpret and utilize the different tools of Green Chemistry towards generating a zero waste environment.

Text Books:

1. Kurian Joseph & R. Nagendran, "Essentials of Environmental Studies", 1st Edition , Pearson Education, 2004.

Reference Books:

1. Keerthinarayana & Daniel Yesudian,"Environmental Science and Engineering",1st Edition, Hi-Tech publications, 2004.
2. Erach Bharucha, "A Text Book for Environmental Studies", Text Book of University Grants Commission, 2004.
3. Metcalf & Eddy,"Wastewater Engineering: Treatment and Reuse", New Delhi, TMH

Course Content:

Unit I: Environment & Natural Resources **9 hours**

Definition, scope, importance, need for public, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, land slides, soil erosion, desertification & case studies.

Unit II: Ecology & Bio-Diversity **9 hours**

Concept of ecosystem, structure & function of an ecosystem, producers, consumers and decomposers, energy flow, ecological succession, food chains, food webs and ecological pyramids. Bio diversity: Definition, genetic,

species and ecosystem diversity, bio-geographical classification of India, hotspots, threats related to habitat loss, poaching of wildlife, man-wildlife conflicts, Conservation of bio-diversity.

Unit III: Environmental Pollution **9 hours**

Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid `waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit IV: Social Issues and the Environment **9 hours**

Urban problems related to energy & sustainable development, water conservation, rain water harvesting, watershed management, problems related to rehabilitation – case studies, Wasteland reclamation, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness.

Unit V: Human Population and the Environment **9hours**

Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/ AIDS, Women and Child Welfare, Role of Information Technology – Visit to local polluted site / Case Studies.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	**Numerical Methods for Problem solving**				
Name of the Course	**Numerical Methods for Problem Solving**				
Course Code	**BSCS1210**				
Prerequisite	Engineering Mathematics				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

The objectives of the course are to make the students,

1. To develop the mathematical skills of the students in the areas of numerical methods.
2. To teach theory and applications of numerical methods in a large number of engineering subjects which require solutions of linear systems, finding eigen values, eigenvectors, interpolation and applications, solving ODEs, PDEs and dealing with statistical problems like testing of hypotheses.
3. To lay foundation of computational mathematics for post-graduate courses specialized studies and research.

Course Outcomes:

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

CO1	Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.
CO2	Apply various interpolation methods and finite difference concepts.
CO3	Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.
CO4	Work numerically on the ordinary differential equations using different methods through the theory of finite differences.
CO5	Work numerically on the partial differential equations using different methods through the theory of finite differences.

Text Books:

1. Grewal. B.S., and Grewal. J.S.,"Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2007
2. Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6 th Edition, New Delhi, 2006.

Reference Books:

1. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

Course Content:

Unit I: Solution of Equations and Eigenvalue Problems 10 hours Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method- Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.solving: Bisection Method, Newton-Raphson method, Iteration method.
Unit II: Interpolation And Approximation 9 hours Interpolation with unequal intervals - Lagrange's interpolation – Newton‟s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton‟s forward and backward difference formulae.

Unit III: Numerical Differentiation and Integration 9 hours Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson‟s 1/3 rule – Romberg‟s method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson‟s 1/3 rules.
Unit IV: Initial Value Problems For Ordinary Differential Equations 10 hours Single Step methods - Taylor‟s series method - Euler‟s method - Modified Euler‟s method – Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne‟s and Adams-Bash forth predictor corrector methods for solving first order equations.
Unit V: Boundary Value Problems in Ordinary and Partial Differential Equations 9hours Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace‟s and Poisson‟s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods –One dimensional wave equation by explicit method.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of the Course	Data Structure and Algorithms				
Course Code	**BSCS1220**				
Prerequisite	Fundamentals of Algorithms				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

The objective of this course is to teach students various data structures and to explain them algorithms for performing various operations on these data structures.

Course Outcomes:

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

CO1	Demonstrate familiarity with major algorithms and data structures.
CO2	Analyze performance of algorithms and choose the appropriate data structure and algorithm design method for a specified application.
CO3	Determine which algorithm or data structure to use in different scenarios and be familiar with writing recursive methods.
CO4	Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs and Use various data structures effectively in application programs.
CO5	Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
CO6	Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
CO7	Gain knowledge about B- Trees.

Text Books:

1. Seymour Lipschutz, "Data Structures", Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines, New Delhi.
2. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "Data Structures Using C", Prentice Hall of India Pvt. Ltd., New Delhi.

Reference Books:

1. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw- Hill International Student Edition, New York.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

Course Content:

Unit I: Introduction **9 hours** The concept of data structure, Abstract data type, data structure operations, algorithms complexity, time-space tradeoff. Introduction to strings, storing strings, string operations, pattern matching algorithms.
Unit II: LINKED LIST **9 hours** Linked list: Introduction and basic operations, Header nodes, Doubly Linked List, Circular Linked List, Applications of Linked List. Stack: primitive operation on stack, Representation of Stack as Linked List and array, Stacks applications.
Unit III: QUEUES AND TREES **9 hours**

Introduction to queues, Primitive Operations on the Queues, Circular queue, Priority queue, Representation of Queues as Linked List and array, Applications of queue. Trees - Basic Terminology, Binary Trees, Tree Representations using Array & Linked List, Basic operation on Binary tree, Traversal of binary trees:- In order, Preorder & post order, Applications of Binary tree.
Unit IV: GRAPHS **9 hours** Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs.
Unit V: SEARCHING & SORTING **9 hours** Searching: linear search, Binary search, Sorting: Insertion sort, Selection sort, Quick sort, Bubble sort.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Operating Systems				
Name of the Course	**Operating System**				
Course Code	**BSCS1230**				
Prerequisite	Fundamentals of Computers				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

The course familiarizes the student with basic knowledge of computer operating systems. The objective of the course is to provide basic knowledge of computer operating system structures and functioning.

Course Outcomes:

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

CO1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
CO2	Understand the difference between process & thread, issues of scheduling of user level processes / threads and their issues & use of locks, semaphores, monitors for synchronizing multiprogramming with multithreaded systems and implement them in multithreaded programs.
CO3	Gain knowledge about the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
CO4	Demonstrate the design and management concepts along with issues and challenges of main memory, virtual memory and file system.
CO5	Understand the types of I/O management, disk scheduling, protection and security problems faced by operating systems and how to minimize these problems.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

References:

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
3. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw HillEducation", 1996.
4. D M Dhamdhere, "Operating Systems: A Concept-Based Approach", Second Edition, TataMcGraw-Hill Education, 2007. 5. http://nptel.ac.in/.

Course Content:

Unit I: OPERATING SYSTEMS OVERVIEW 9 Hours Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor And Multicore Organization. Operating System Overview-Objectives And Functions, Evolution Of Operating System.- Computer System Organization- Operating System Structure And Operations- System Calls, System Programs, OS Generation And System Boot.
Unit II: PROCESS MANAGEMENT 9 Hours Processes-Process Concept, Process Scheduling, Operations On Processes, Interprocess Communication; Threads- Overview, Multicore Programming, Multithreading Models; Windows 7 – Thread And SMP Management. Process Synchronization – Critical Section Problem, Mutex Locks, Semophores, Monitors; CPU Scheduling And Deadlocks.

Unit III: STORAGE MANAGEMENT **9 Hours** Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 And 64 Bit Architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.
Unit IV: I/O SYSTEMS **9 Hours** Mass Storage Structure- Overview, Disk Scheduling And Management; File System Storage-File Concepts, Directory And Disk Structure, Sharing And Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.
Unit V: CASE STUDY **9hours** Linux System- Basic Concepts;System Administration-Requirements For Linux System Administrator, Setting Up A LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen,Vmware On Linux Host And Adding Guest OS.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	**Object Oriented Programming with C++**				
Course Code	**BSCS1240**				
Prerequisite	C Language				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. To get a clear understanding of object-oriented concepts.
2. To understand object-oriented programming through C++.

Course Outcomes:

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

CO1	Gain the basic knowledge on Object Oriented concepts.
CO2	Develop applications using Object Oriented Programming Concepts
CO3	Demonstrate the differences between traditional imperative design and object oriented design
CO4	Explain class structures as fundamental, modular building blocks
CO5	Understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code
CO6	Write small/medium scale C++ programs with simple graphical user interface
CO7	Understand the file handling and error handling machanisms in C++
CO8	Get knowledge to use strings and Streams in C++
CO9	Implement features of object oriented programming to solve real world problems

Textbook

1. Balagurusamy E, "Object Oriented Programming with C++", Tata McGraw Hill, 2006.

References:

1. Andrew C. Staugaard JR, "Structured and Object-Oriented Problem Solving Using C++", Third Edition, Prentice Hall, 2002.
2. Herbert Schildt, "C++: The Complete Reference", Third Edition, Tata McGraw Hill, 1999
3. Yashavant Kanethkar, "Let us C++", BPB Publications, 1999.
4. Bruce Eckel, "Thinking in C++", Second Edition, Pearson Education, 2001.

Course Content:

Unit I: STRUCTURED PROGRAMMING – I 9 hours Programming Languages – Programming Paradigms - Background of C++ - First Program in C++ - Structure of C++ Program - Data Types - Basic Data Types – User Defined Data Types– Expressions – Tokens, Keywords and Identifiers – Constants and Variables - Operators– Statements – Assignment - Input Output Objects – Manipulators -Control Structures – Selection Statement – Iteration Statements – Arrays and Strings.
Unit II: STRUCTURED PROGRAMMING - II 9 hours Structures, Unions and Enumerations – Functions – Function Prototyping – Call by Value, Call by Reference- Inline Functions- Recursion - Pointers - Default Arguments - Passing arrays to Functions – Passing Structures to Functions – Function Overloading – Using Pointers as Function Arguments and Parameters - File I/O – File Classes – File Operations – Random Access
Unit III: CLASSES AND OBJECTS 9 hours Characteristics of Object Orient Programming - Classes and Objects – Data Members - Member Functions - Constructors and Destructors – Friend Functions – Friend Classes – Static Class Members – Object Pointers.
Unit IV: INHERITANCES AND POLYMORPHISM 9 hours Operator Overloading – Inheritance – Protected Members – Inheriting Multiple Base Classes – Virtual Base Classes – Polymorphism – Virtual Functions – Virtual Base Classes – Dynamic versus Static Binding.

Unit V: TEMPLATES AND EXCEPTION HANDLING **9hours**
Templates – Generic Functions – Applying Generic Functions – Generic Classes - Exception handling – Standard Template Library – Container Classes – Lists – Maps – Algorithms – String.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of the Course	**Introduction to Data Science**				
Course Code	**BSCS1260**				
Prerequisite	Mathematics and Statistics				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

Understanding Data Science Process and learning techniques, tools, Statistical Methodologies and Machine learning algorithms used in the process.

Course Outcomes:

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

CO1	The students should be able to understand & comprehend Data science problem; and should be able to provide analytical solution to it.

Reference Books:

1. 1.Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. 2.Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
3. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
4. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.
6. Nathan Yau, "Visualize This: The FlowingData Guide to Design, Visualization, and Statistics", Wiley, 2011.
7. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",
8. Wiley, ISBN: 9788126551071, 2015.

Course Content:

Unit I: INTRODUCTION TO DATA SCIENCE: 9 hours Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.
Unit II: MODELING METHODS 9 hours Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.
Unit III: INTRODUCTION TO R Language: 9 hours Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution.
Unit IV: MAP REDUCE - I **9 hours** Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture.
Unit V: MAP REDUCE - II **9 hours**

Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution- . Case studies.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of the Course	Data Structure and Algorithm Lab				
Course Code	**BSCS1221**				
Prerequisite	C++				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

1. To develop skills to design and analyze simple linear and non linear data structures
2. To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
3. To Gain knowledge in practical applications of data structures .

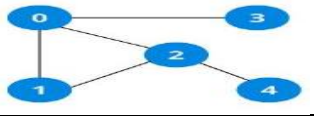
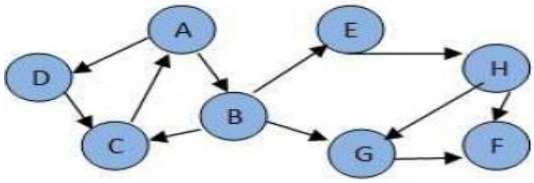
Course Outcomes:

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

CO1	Design and analyze the time and space efficiency of the data structure
CO2	Capable to identity the appropriate data structure for given problem
CO3	Get practical knowledge on the application of data structures
CO4	Implement linked list data structure to solve various problems.
CO5	Apply graph and tree traverse technique to various applications.
CO6	Implement Dijkstra‟s algorithm, Btrees and hash tables.
CO7	Understand and apply various data structure such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.

List of Experiments:

S.No	
1.	Develop a C program get an input from user and perform PUSH, POP, Overflow, Underflow operations and display the result by a stack implemented using array.
2.	Develop a C program get an input from user and perform enqueue, dequeue operations and display the result through a queue implemented using array.
3.	A Queue is maintained as linked list and F and R are front and rear location of the queue respectively. Write a C program to implement the following operation. 1.) Obtain the formula for N, the number of elements in the queue in terms of F and R. 2.) Write a function to delete an element in the queue. 3.) Write a function to insert an item X into the queue. 4.) Test the program with a set of 10 inputs.
4.	Develop a C program get an input from user and perform enqueue, dequeue operations and display the results by a Circular Queue Using array.
5.	Develop a C program get an input from user and perform enqueue, dequeue operations and display the results by a Circular Queue Using Linked list.
6.	Create a C program using singly linked list and get an input from user and perform the following operations: Insert, Delete on (first, Middle, Last) and display the output.
7.	Create a C program using Double linked list and get an input from user and perform the following operations: Insert, Delete on (first, Middle, Last) and display the output.

8.	Create a C program using circular linked list and get an input from user and perform the following operations: Insert, Delete on (first, Middle, Last) and display the output.
9.	Develop a C program to implement depth first Graph traversal for the following graph. 
10.	Create a C program to implement Breadth first Graph traversal for the following graph. 
11.	Create a C program to the graph traversal and perform infix, prefix and postfix expressions. Write two functions Intopo() and Potopr() to accept an infix expression and convert it from infix from postfix notation and postfix to prefix notation. Test the program with the following example. (A+B)*(C-D)^2*((I-J)^6).
12.	Using Divide and Conquer Strategy, write a c program to perform sorting on the following list given. (Hint: Quick Sort procedure shall be used) 23, 12, 4,109, 34, 55, 77, 11, 6, 55,111, 33.
13.	Using Divide and Conquer Strategy, write a C program to perform sorting on the following list given. (Hint: Insertion Sort procedure shall be used) 23, 12, 4,109, 34, 55, 77, 11, 6, 55,111, 33.
14.	Using Divide and Conquer Strategy, create a C program to perform sorting on the following list given. (Hint: Selection Sort procedure shall be used) 23, 12, 4,109, 34, 55, 77, 11, 6, 55,111, 33.
15	Write a program in C to implement Dijkstra's shortest path algorithm for a givendirected graph. 
16	Write a C program for bubble sort. Apply bubble sort algorithm for the following list of elements: 5 1 12 -5 16 10 -3 -9 9

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of the Course	Object Oriented Programming with C++ Lab				
Course Code	**BSCS1241**				
Prerequisite	C++				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

To make the student learn an object oriented way of solving problems.

1. To make the student to identify and practice the object-oriented programming
2. concepts and techniques. To practice the use of C++ classes and class libraries, modify existing C++ classes.
3. To develop C++ classes for simple applications

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

CO1	Apply object-oriented programming features to program design and implementation
CO2	Understand object-oriented concepts and how they are supported by C++
CO3	Understand implementation issues related to object-oriented techniques.
CO4	Analyze, use, and create functions, classes, to overload operators.
CO5	Use inheritance and Pointers when creating or using classes and create templates
CO6	Understand and use Exception handling and file handling mechanism.

List of Experiments:

S.No	Title of Lab Experiments
1	Demonstration of C++ Programs to Implement Various Control Structures. a. If statement b. Switch case statement and do while loop c. For loop d. While loop
2	Demonstration of Programs to Understand Structure & Unions. a. Structure b. union
3	Demonstration of Programs to Understand Pointer Arithmetic using C++.
4	Demonstration of Functions & Recursion using C++.
5	Design and implementation of Inline Functions in C++.
6	Demonstration and implementation of Programs to Understand Different Function Call Mechanism using C++. a. Call by reference b. Call by Value
7	Implementation of Programs to Understand Storage Specifiers in C++
8	Demonstration of Constructors & Destructors in C++
9	Demonstration of Use of “this” Pointer Using class

10	Programs to Implement Inheritance and Function Overriding. a. Multiple inheritances –Access Specifiers b. Hierarchical inheritance – Function Overriding /Virtual Function
11	Programs to Overload Unary & Binary Operators as Member Function & Non Member Function. a. Unary operator as member function **b.** Binary operator as non member function
12	Programs to Understand Friend Function & Friend Class. a. Friend Function b. Friend class
13	Programs on Class Templates using C++.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Application oriented programming using Python				
Course Code	**BSCS1251**				
Prerequisite	Python				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	4	2	

Course Objectives:

The objective of this paper is to introduce various concepts of programming to the students using Python.

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

CO1	Develop Python Programs on their own
CO2	Understand File Processing.
CO3	Develop GUI.
CO4	Understand Client Server Programming.
CO5	Apply problem solving skills and implement any real world problems.

List of Experiments:

List of Experiments	
1	Implement Python script to read person's age from keyboard and display whether he is eligible for voting or not.
2	Implement Python script to find biggest number between two numbers.
3	Implement Python Script to generate prime numbers series up to n
4	Implement Python Script to check given number is palindrome or not.
5	Implement Python script to print factorial of a number.
6	Implement Python Script to perform various operations on string using string libraries
7	Implement Python Script to check given string is palindrome or not.
8	Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.
9	Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.
10	Define a function which generates Fibonacci series up to n numbers
11	a) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program:34,67,55,33,12,98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34', '67', '55', '33', '12', '98'). b) With a given tuple (1,2,3,4,5,6,7,8,9,10), write a program to print the first half values in one line and the last half values in one line.

12	a) Write a python script to perform basic dictionary operations like insert, delete and display. b) Write a python script to find frequency of words in a file using dictionaries.
13	a) Write Python script to display file contents. b) Write Python script to copy file contents from one file to another.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Professional Communication				
Course Code	SLBC1002				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	4	2

Course Objectives:

1. Advance leadership knowledge and skills based upon communication principles.
2. Increase understanding of relating to others at work.
3. Improve knowledge and skills in characteristics of effective collaboration
4. Develop awareness of managing time and wellness in the workplace
5. Develop verbal and written presentation skills.

Course Outcomes:

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

CO1	Send and interpret verbal and nonverbal messages with accuracy and effectiveness.
CO2	Recognize differences that impact members of an organization and enact appropriate communication strategies to help attain diversity.
CO3	Prepare personal career goals.
CO4	Develop communication and critical thinking skills necessary for securing a job and succeeding in the diverse, ever-changing workplace.
CO5	Demonstrate knowledge of leadership styles and approaches
CO6	Build positive interpersonal relationships in the workplace.
CO7	Plan and conduct an interview in both interviewee and interviewer roles.
CO8	Distinguish groups and teams and recall communication factors that influence the effective development of teams.
CO9	Demonstrate competence in making a decision as a team.
CO10	Identify and overcome common obstacles in group meetings.
CO11	Demonstrate knowledge of leadership and problem solving communication in teams.
CO12	Create and deliver a business presentation.
CO13	Anticipate and respond to questions during a presentation.
CO14	Plan and create proper business documents.
CO15	Demonstrate knowledge of research and theories regarding wellness in the workplace.
CO16	Demonstrate awareness and knowledge of workplace ethics.
CO17	Demonstrate knowledge of workplace and professional etiquette.

Text Books:

1. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, New Delhi .
2. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press 2007, New Delhi.

Reference Books:

1. Effective Technical Communication by Barun K. Mitra, Oxford Univ. Press, 2006, Delhi.
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., New Delhi.
3. How to Build Better Vocabulary by M.Rosen Blum, Bloomsbury Pub. London.
4. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors; Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Banerji- Macmillan India Ltd. Delhi.
6. Manual of Practical Communication by L.U.B. Pandey & R.P. Singh; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, Delhi.

Course Content:

Unit I: Basics of Technical Communication 9 hours Technical Communication: features; Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group); Importance of technical communication; Barriers to Communication.
Unit II: Constituents of Technical Written Communication 8 hours Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods -Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps.
Unit III: Forms of Technical Communication 8 hours Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order, Claim and Adjustment Letters; Job application and Resumes. Official Letters: D.O. Letters; Govt. Letters, Letters to Authorities etc. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance. Technical Paper, Project. Dissertation and Thesis Writing: Features, Methods & Writing.
Unit IV: Presentation Strategies 7 hours Defining Purpose; Audience & Locale; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Space; Setting Nuances of Voice Dynamics; Time- Dimension.
Unit V: Fundamentals of Human Relations: 8 hours Intra-personal, Interpersonal and Group Relationships, Transactional Analysis Implications for Managers in Organizational Context. Formal Written Communication: Official Letters, Report, Writing: Categories Formats, Memorandums and Circulars, Agenda and Minutes, Resume, Drafting Advertisements. Enquires and Replies, Quotations, Voluntary Offers, Placing of Order, Cancellation of Order, Complains and Adjustments. Formal Verbal Communication: Group Discussion, Interview, Extempore, Business Negotiation, Public Speaking, Meeting, Toasting, Counselling, Business Presentation. Negotional Skills. Social Skills for Managers: Update of Etiquettes a Manager should observe in Various Formal and Informal Situations; The Knowledge of Body Language.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	**Japanese-II**				
Course Code	**JAPA1002**				
Prerequisite	**Communicative Japanese -I**				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

1. This course attempts to give the students a working knowledge of Japanese Language with emphasis on communicative competence.
2. This course will introduce reading and writing Japanese scripts, Hiragana and Katakana.
3. Basic Japanese sentences will be introduced and practiced thoroughly.
4. Sufficient vocabulary will be given to the students to enable them to use the language patterns taught in various contexts.
5. This course aims to give the students an interdisciplinary approach in order to compete in the globalized world.
6. This course will expose the students to a new culture which promotes respect for the 'others' and inculcates tolerance.

Course Outcomes:

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

CO1	On completion of the course, the students will be able to read and write Hiragana and Katakana; speak short sentences and answer questions in Japanese.
CO2	They will be able to read short passages written in Hiragana.
CO3	They will acquire a basic understanding of Japanese society and culture.

Text Books:

1. Shokyuu Nihongo, Japanese Language Center for International Students, Tokyo University of foreign Studies, Japan.
2. Nihongo Kana nyuu mon, Japan foundation, Japan.
3. Shin Nihongo no KISO-1, AOTS, 3A Corporation, Japan.

References:

1. Random House Japanese-English Dictionary
2. Japanese for Busy people, Video CD, AJALT, Japan.

Course Content:

Unit I: 7.Gomen kudasai (audio Practice) 8.Soro soro shitsurei shimasu. (audio Practice)
Unit II: 9.Gin-nen de. (audio Practice) 10.Chiri-- so—su wa arimasuka. (audio Practice)
Unit III: 11.Kore onegai shimasu. (audio Practice) 12.Omatsuri wa doo deshitaka. (audio Practice)
Unit IV: 13.Betsu betsu ni onegai shimasu. (audio Practice)

14.KURIKAESU

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	iOS, Android APP Development Lab				
Course Code	BSCS9011				
Prerequisite	Java and OS				
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	4	2

Course Objectives:

The student should be made to:

1. Know the components and structure of mobile application development frameworks for iOS, Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks.
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. Understand the capabilities and limitations of mobile devices.

Course Outcomes:

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

CO1	Design and Implement various mobile applications using emulators.
CO2	Deploy applications to hand-held devices.

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours

2. Develop an application that uses Layout Managers and event listeners.

3. Develop a native calculator application.

4. Write an application that draws basic graphical primitives on the screen.

5. Develop an application that makes use of database.

6. Develop an application that makes use of RSS Feed.

7. Implement an application that implements Multi threading

8. Develop a native application that uses GPS location information.

9. Implement an application that writes data to the SD card.

10. Implement an application that creates an alert upon receiving a message.

11. Write a mobile application that creates alarm clock

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Engineering Economics and Management				
Course Code	**BSCS2310**				
Prerequisite	Economics				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

The course is intended to provide basic understanding of Economics and Management to engineering students with following aspects:

To impart knowledge, with respect to concepts, principles and practical applications of Economics, which govern the functioning of a firm/organization under different market conditions.

To help the students to understand the fundamental concepts and principles of management; the basic roles, skills, functions of management, various organizational structures and basic knowledge of marketing.

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

CO1	Students will describe basic concepts of Metrology.
CO2	Students will select linear measuring instrument for measurement of various components
CO3	Students select angular and taper measurement devices for measurement of various components.
CO4	Students will discriminate between various screws by measuring their dimensions.
CO5	Students will separate different gears through measurement of various dimensions of gears.
CO6	Students will discriminate capabilities of machining process by measuring surface finish of the component produced
CO7	Students will evaluate quality of surface produced using various methods.
CO8	Students will describe basic concepts of mechanical measurement and errors in measurements
CO9	Students will select appropriate temperature measuring device for various applications.
CO10	Students will describe methods of measurement for various quantities like force, torque, power, Displacement, velocity/seed and acceleration.

Reference Books:

1. Engineering Economics, R.Paneerselvam, PHI publication
2. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.
3. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning
4. Principles and Practices of Management by L.M.Prasad
5. Principles of Management by Tripathy and Reddy
6. Modern Economic Theory, By Dr. K. K. Dewett & M. H. Navalur, S. Chand Publications

Course Content:

Unit I: **9 hours**
Introduction to Economics; Definitions, Nature, Scope, Difference between Micro economics & Macro economics. Theory of Demand & Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity; elasticity of demand, price elasticity, income elasticity, cross elasticity.
Unit II: **9 hours**

Markets; meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly).- National Income; meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP,NDP, Personal income, disposal income.
Unit III: 9 hours Introduction to Management; Definitions, Nature, scope Management & Administration, skill, types and roles of managers, Management Principles; Scientific principles,Administrative principles, Maslow's Hierarchy of needs theory - Functions of Management; Planning, Organizing, Staffing, Directing and Controlling.
Unit IV: 9 hours Introduction to Marketing management; Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation- Introduction to Finance Management; meaning, scope, sources, functions.
Unit V: 9hours Introduction to Production Management; definitions, objectives, functions, plant layout- plant location- Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Database Management System				
Course Code	BSCS2320				
Prerequisite	Query Languages				
Corequisite					
Antirequisite					
	L	T	P	C	
	3	0	0	3	

Course Objectives:

To educate students with fundamental concepts of Data Base Management System, Data Models, Different Data Base Languages.

Course Outcomes:

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

CO1	Analyze Database design methodology.
CO2	Acquire knowledge in fundamentals of Data Base Management System.
CO3	Analyze the difference between traditional file system and DBMS.
CO4	Handle with different Data Base languages.
CO5	Draw various data models for Data Base and Write queries mathematically.
CO6	Design data base and normalize data and Understand how query are being processed and executed.
CO7	Deal with online transactions and control Concurrency.
CO8	Understand types of Data Base failures and Recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", Fourth Edition, McGraw-Hill, 2002.

References:

1. Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003.
2. Raghu Ramakrishnan, "Database Management System", Tata McGraw- Hill Publishing Company, 2003.
3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000.
4. Peter Rob and Corlos Coronel- "Database System, Design, Implementation and Management", Thompson Learning Course Technology- Fifth edition, 2003

Course Content:

Unit I: Introduction **9 hours** Introduction: An overview of database management system- database system vs file system-Database system concept and architecture- data model schema and instances- interfaces-DDL-DML-Overall Database Structure.
Unit II: ER Modelling & SQL **9 hours** Data Modeling using the Entity Relationship Model: ER model concepts-notation for ER diagram-mapping constraints- keys- Concepts of Super Key- candidate key-primary key-Generalization- aggregation-reduction of an ER diagrams to tables-extended ER model-Relational Algebra-Introduction to SQL- Basic Queries – Complex SQL Queries – Views
Unit III: Database Normalization **9 hours**

Functional dependencies-normal forms- first- second- third normal forms- BCNF- inclusion dependence-loss less join decompositions
Unit IV: Transaction Processing Concept **9 hours** Transaction system- Testing of serializability - serializability of schedules- conflict & view serializable schedule- recoverability-Recovery from transaction failures- log based recovery- checkpoints-deadlock handling.
Unit V: Concurrency Control Techniques **9hours** Concurrency control-Locking Techniques for concurrency control-Time stamping protocols for concurrency control- validation based protocol- multiple granularity

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Java Programming				
Course Code	BSCS2330				
Prerequisite	Object Oriented Programming				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives

To introduce students to the Java programming language.

1. To create Java programs that leverage the object-oriented features of the Java.
2. language, such as encapsulation, inheritance and polymorphism; use data types, arrays and other data collections;
3. To implement I/O functionality to read from and write to text files.

Course Outcomes:

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

CO1	Understanding of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements
CO2	Implement, compile, test and run Java programs comprising more than one class, to address a particular software problem
CO3	Demonstrate the principles of object oriented programming;
CO4	Use simple data structures like arrays in a Java program
CO5	Understand the concept of package, interface, multithreading and File handling in java.
CO6	Use members of classes found in the Java API (such as the Math class).
CO7	Employ various types of selection constructs in a Java program.
CO8	Employ a hierarchy of Java classes to provide a solution to a given set of requirements.

Text Books:

1. R. Naughton and H. Schildt – Java2 (The Complete Reference) – Fifth Edition – TMH – 2004.

Reference Books:

1. K. Arnold and J. Gosling – The Java Programming Language – 3rd Edition., Pearson Edu,2005.
2. David Flanagan – Java in a Nutshell: A Desktop Quick Reference for Java Programmers–O'Reilly & Associates, Inc. 1999
3. Bruce Eckel –Thinking in Java – Prentice Hall, 2nd Ed 2002.

Course Content:

Unit I: Introduction **9 hours** Introduction - Object oriented fundamentals, History-Java and the Internet-Java Applets and Applications, Features of Java, Java Virtual Machine (JMV), Byte-Code ,JAVA buzzwords, JAVA Environments, Command Line Arguments, Java program structure, Reserved keywords, Identifiers, Literals, Operators, Separators, Variables, Declaring a variable, Scope and lifetime of variables, Data types, Type conversion, casting
Unit II: **8 hours**

Control Statements, Arrays- One-Dimensional Arrays, Two-dimension Array, Vectors, Operators-Arithmetic, Boolean logical, Relational and Bitwise operators-Operator Precedence. Class :Fundamentals ,The General Form of a Class ,A Simple Declaring Objects, Assigning Object Reference Variables, Methods: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing ,Returning Objects, Recursion Introducing Access Control, Overriding Methods, Final Variables and Methods, Final class, Finalizer Methods, Abstract Methods and Class, Visibility Control, Constructors
Unit III: 8 hours String : Strings, String Constructors, String length, String Literals, String Concatenation, data types-String conversion. Inheritance : basic,Types of Inheritance, Member Access, Creating a Multilevel Hierarchy, When Constructors Are Called Method Overriding, Why Overridden Methods?, Abstract Classes, Using final with Inheritance, Using final to Prevent Overriding . Using final to Prevent Inheritance, Packages and Interfaces.
Unit IV: 7 hours Exception Handling: Exceptions Exception hierarchy, Try, Catch, Finally, Throw.
Unit V: 8 hours Java.io Package-I/O Basics-Reading console Input-Writing console output Print Writer class -Reading and Writing files-Java I/O classes, Byte Stream Classes, Character Stream.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Computer Graphics				
Course Code	**BSCS2340**				
Prerequisite	Graphics Drawing				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

This course is designed to provide a comprehensive introduction to computer

1. Graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

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

CO1	Demonstrate an understanding of contemporary graphics hardware.
CO2	Create interactive graphics applications in C++ using one or more graphics application programming interfaces
CO3	Write program functions to implement graphics primitives
CO4	Write programs that demonstrate geometrical transformations.
CO5	Demonstrate an understanding of the use of object hierarchy in graphics applications.
CO6	Write program functions to implement visibility detection.
CO7	Write programs that demonstrate computer graphics animation.
CO8	Write programs that demonstrate 2D image processing techniques.

Text Books:

1. Hearn D and Baker M.P, "Computer graphics – C Version", 2nd Edition, Pearson Education, 2004(unit 1, 2 & 3)
2. Ralf Steinmetz, Klara steinmetz, "Multimedia Computing, Communications and Applications", Pearson education, 2004 (Unit 4 & 5)

References:

1. Siamon J. Gibbs and Dionysios C. Tsichritzis, "Multimedia programming", Addison Wesley, 1995.
2. John Villamil, Casanova and Leony Fernanadez, Eliar, "Multimedia Graphics", PHI, 1998.

Course Content:

Unit I: INTRODUCTION **9 hours** Overview of Graphics System - Bresenham technique – Line Drawing and Circle Drawing Algorithms - DDA - Line Clipping - Text Clipping.
Unit II: 2D TRANSFORMATIONS **9 hours** Two dimensional transformations – Scaling and Rotations - Interactive Input methods - Polygons - Splines – Bezier Curves - Window view port mapping transformation.
Unit III: 3D TRANSFORMATIONS **9 hours**

3D Concepts - Projections – Parallel Projection - Perspective Projection – Visible Surface Detection Methods - Visualization and polygon rendering – Color models – XYZ-RGB-YIQ-CMY-HSV Models - animation – Key Frame systems - General animation functions - morphing.
Unit IV: Application – I **9 hours** Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring.
Unit V: Application – II **9 hours** Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Design and Analysis of Algorithms				
Course Code	BSCS2350				
Prerequisite	Data Structure				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand and apply the algorithm analysis techniques.
2. To critically analyze the efficiency of alternative algorithmic solutions for the same problem
3. To understand different algorithm design techniques.
4. To understand the limitations of Algorithmic power.

Course Outcomes:

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

CO1	Design algorithms for various computing problems
CO2	Analyze the time and space complexity of algorithms.
CO3	Critically analyze the different algorithm design techniques for a given problem.
CO4	Modify existing algorithms to improve efficiency.

Text Books:

1 Anany Levitin, Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012.

2 Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

References:

1 Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms‖, Third Edition, PHI Learning Private Limited, 2012.

2 Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms‖, Pearson Education, Reprint 2006.

3 Harsh Bhasin, Algorithms Design and Analysis‖, Oxford university press, 2016.

4 S. Sridhar, Design and Analysis of Algorithms‖, Oxford university press, 2014.

Course Content:

Unit I: INTRODUCTION 9 hours Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Mathematical analysis for Recursive and Non-recursive algorithms.
Unit II: BRUTE FORCE AND DIVIDE-AND-CONQUER 9 hours

Brute Force – Computing an – String Matching – Travelling Salesman Problem – Knapsack Problem – Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort – Multiplication of Large Integers.
Unit III: DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9 hours Dynamic programming – Principle of optimality – Computing a Binomial Coefficient – Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Prim's algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern – Huffman Trees.
Unit IV: ITERATIVE IMPROVEMENT 9 hours The Simplex Method – The Maximum- Flow Problem – Maximum - Stable marriage Problem.
Unit V: COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9hours Lower – Bound Arguments – P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem –Subset Sum Problem. – LIFO Search and FIFO search – Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	-	50	100

Name of The Course	DATABASE MANAGEMENT SYSTEMS LAB				
Course Code	**BSCS2321**				
Prerequisite	DBMS				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

The student should be made to:

1. Learn to create and use a database.
2. Be familiarized with a query language.
3. Have hands on experience on DDL Commands.
4. Have a good understanding of DML Commands and DCL commands.
5. Familiarize advanced SQL queries.
6. Be exposed to different applications.

Course Outcomes:

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

CO1	Design and implement a database schema for a given problem-domain.
CO2	Populate and query a database
CO3	Create and maintain tables using PL/SQL.
CO4	Prepare reports.

LIST OF EXPERIMENTS:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions
11. Mini project (Application Development using Oracle/ Mysql) (any one)

a) Student Management System.
b) Hospital Management System.
d) Railway Reservation System.
e) Personal Information System.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Java Programming Lab				
Course Code	**BSCS2331**				
Prerequisite	Java				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

1. To be knowledgeable enough about basic Java language syntax and semantics to be able to successfully read and write Java computer programs;
2. To have obtained experience designing, implementing, testing, and debugging graphical user interfaces that respond to user events using Java;

Course Outcomes:

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

CO1	Understand programming language concepts, particularly Java and object-oriented concepts
CO2	Write, debug, and document well-structured Java applications.
CO3	Implement Java classes from specifications and effectively create and use objects from predefined class libraries.
CO4	Understand the behaviour of primitive data types, object References:, and arrays.
CO5	Apply decision and iteration control structures to implement algorithms.
CO6	Write simple recursive algorithms.
CO7	Implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling.

List of Experiments:

S.No.	Program List
1.	Write a Java Program to perform the arithmetic operations using switch case.
2.	Write a program to check the input character for uppercase, lowercase, no. of digits and other characters.
3.	Write a java program to find the greatest among three numbers.
4.	Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.
5.	Write a java program to implement binary search mechanism in use of following concepts (Operations, Expressions, Control-flow, Strings)
6.	Write a Java program that reads a line of integers and then displays each integer, and the sum of all the integers(Use String Tokenizer class of java.util)
7.	Write a Java Program for sorting a given list of names in ascending order.
8.	write a JAVA program to implement class mechanism. - Create a class, methods and invoke them inside main method.
9.	Write a java program to call a windows run time comments.

10.	Write a java program to calculate the area of square, rectangle and circle using method overloading.
11.	Write a java program to calculate the area of circle and cylinder using method overriding.
12.	Write a java program to calculate the area of rectangle, triangle and circle method abstract class.
13.	Write a java program that implements the concept of package creation.
14.	Write a java program that implements Interface concept using basic mathematical function.
15.	Write a java program to implements exception handling techniques and its concepts.
16.	Write a Java program that implements a multithreaded program has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.
17.	Write a java program to implement Inter Process (Inter Thread) Communication between classes and there by using the mutual exclusion among them to display and produce the output.
18	Create an application for color class by using Applet.
19	Create an applet application using the Key Event class and KeyListener interface.
20	create an applet application for dialog box creation using Frames
21	Create an applet application (Mouse Events) for MouseListener and MouseMotionListener interface.
22	Create an application to display the calendar of a month based on users choice of month and year.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	COMPUTER GRAPHICS LAB				
Course Code	**BSCS2341**				
Prerequisite	Graphics				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

The student should be made to:

1. Understand graphics programming
2. Be exposed to creation of 3D graphical scenes using open graphics library suits
3. Be familiar with image manipulation, enhancement
4. Learn to create animations
5. To create a multimedia presentation/Game/Project.

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

CO1	Create 3D graphical scenes using open graphics library suits
CO2	Implement image manipulation and enhancement
CO3	Create 2D animations using tools

LIST OF EXPERIMENTS:

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)

2. 2D Geometric transformations –
   Translation
   Rotation Scaling
   Reflection Shear
   Window-Viewport

3. Composite 2D Transformations

4. Line Clipping

5. 3D Transformations - Translation, Rotation, Scaling.

6. 3D Projections – Parallel, Perspective.

7. Creating 3D Scenes.

8. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.

9. 2D Animation – To create Interactive animation using any authoring tool.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	**Design and Analysis of Algorithms Lab**				
Course Code	**BSCS2351**				
Prerequisite	C, C++, Java or Python Languages				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

This course is designed to introduce the students to design and analyse algorithms in terms of efficiency and correctness. The course focuses on highlighting difference between various problem solving techniques for efficient algorithm design.

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

CO1	Given an algorithm, identify the problem it solves.
CO2	Write algorithms choosing the best one or a combination of two or more of the algorithm design techniques: Iterative, divide-n-conquer, Greedy, Dynamic Programming using appropriate data structures.
CO3	Write proofs for correctness of algorithms
CO4	Re-write a given algorithm replacing the (algorithm design) technique used with a more appropriate/efficient (algorithm design) technique.

List of Experiments:

SL. NO.	**EXPERIMENT NAME**
1	Implementation of Sorting Algorithms i) QUICK SORT
2	Implementation of Sorting Algorithms ii) MERGE SORT
3	Implementation of Sorting Algorithms iii) HEAP SORT
4	Implementation of Binary Search Tree Algorithm
5	Implementation of Minimum Spanning Tree
6	Implementation of Knapsack Problem
7	Implementation of 8 Queen's Problem
8	Implementation of All Pair Shortest Path Algorithm
9	Implementation of Travelling Salesman Problem
10	Implementation of Graph Colouring
11	Implementation of Multistage Graphs
12	Selection Sort Using Brute Force Method

Continuous Assessment Pattern:

Internal Assessment (IA)	**Mid Term Exam (MTE)**	**End Term Exam (ETE)**	**Total Marks**

Name of The Course	Artificial Intelligence and Machine Learning			
Course Code	**BSCS2460**			
Prerequisite	Neural Networks			
Corequisite				
Antirequisite				

	L	T	P	C
	3	0	0	3

50	-	50	100

Course Objectives:

1. Build the foundation to designing intelligent agents.
2. To know the importance of the complexity of a given algorithm
3. How should and intelligent agent solve problems
4. AI search techniques, Game Playing, Planning, Knowledge Representation, Reasoning under Uncertainty and Machine Learning.

Course Outcomes:

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

CO1	Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques
CO2	Apply these techniques in applications which involve perception, reasoning and learning.
CO3	Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals
CO4	Acquire the knowledge of real world Knowledge representation
CO5	Demonstrate profciency in applying scientifc method to models of machine learning.

Text Books:

1. Elaine Rich and Kevin Knight: "Artificial Intelligence." Tata McGraw Hill Structure and syllabus of S.Y. B.Tech Computer Engineering. Pattern A-14, A.Y. 2015-16.
2. Stuart Russell & Peter Norvig : "Artificial Intelligence : A Modern Approach", Pearson Education, 2nd Edition.
3. T. Mitchell, " Machine Learning", McGraw-Hill, 1997.
4. Anup Kumar Srivastava, Soft Computing, Alpha Science International limited. 2009.
5. Introduction to neural networks, S. N. Shivanandam, Mc-Graw Hill, 2013.

Reference Books:

1. Ivan Bratko : "Prolog Programming For Artificial Intelligence" , 2nd Edition Addison Wesley, 1990.
2. Eugene, Charniak, Drew Mcdermott: "Introduction to Artificial Intelligence.", Addison Wesley
3. Patterson: "Introduction to AI and Expert Systems", PHI
4. Nilsson : "Principles of Artificial Intelligence", Morgan Kaufmann. 5. Carl Townsend, "Introduction to turbo Prolog", Paperback, 1987
5. Ethem Alpaydin, "Introduction to Machine Learning", MIT press, 2004.
6. Jacek M. Zurada, "Introduction to Artificial neural System", JAICO publishing house,2002.
7. Research papers suggested by the faculty.

Course Content:

Unit I: Fundamentals of Artificial Intelligence **9 hours**

Introduction, A.I. Representation, Non-AI & AI Techniques, Representation of Knowledge, Knowledge Base Systems, State Space Search, Production Systems, Problem Characteristics, types of production systems,

Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation, Criteria for Success, Turing Test.
Unit II: Searching **9 hours** Depth First Search, Breadth First Search, Generate & test, Hill Climbing, Best First Search, A* and AO* Algorithm, Constraint satisfaction, Means-Ends Analysis. Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence, Applications of Minimax Algorithm.
Unit III: Knowledge Representation **9 hours** Knowledge based agents, Wumpus world, Propositional Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining First order Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining. Basics of PROLOG: Representation, Structure, Backtracking, Expert System.
Unit IV: Machine Learning Introduction and Algorithm **9 hours** Introduction to Machine Learning, Machine Learning Algorithm Hidden markov model, Genetic algorithm, SVM, Kernel functions, Linear SVM, Nonlinear SVM, Regression analysis, ensemble classifiers, Validation, evaluation.
Unit V: Clustering Algorithm and recurrent Networks **9hours** k-means algorithm, k-nearest neighbor learning, weighted majority algorithm, Hopefield Net, Hamming net, Maxnet, Kohonen self organizing map, Principal component Analysis (PCA), Applications of machine learning.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Cryptographic and Network Security				
Course Code	**BSCS2470**				
Prerequisite	Idea about Encryption and Decryption.				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

COURSE OBJECTIVES:

1. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. The learner will understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
3. The learner will be able to examine secure software development practices.
4. The learner will understand principles of web security.
5. The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.

Course Outcomes:

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

CO1	An ability to analyze a problem, and to identify and define the computing requirements appropriate to its solution
CO2	An ability to make informed judgements in computing practice based on legal and ethical principles.
CO3	An ability to apply security principles and practices to the environment, hardware, software, and human aspects of a system
CO4	An ability to analyze and evaluate systems with respect to maintaining operations in the presence of risks and threats

Text Books:

1. Cryptography and Network Security - Principles and Practice ,2017 by Stallings William (Author).
2. Firewalls and Network Security Perfect Paperback – 2009 by Whitman Network Security a Practical Approach Paperback – 2005 by Harrington

Course Content:

Unit I: Introduction and Classical Encryption Technique 9 hours OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security. Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.
Unit II Block Ciphers, Data Encryption Standard and Advanced Encryption Standard 9hours Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.
Unit III: Public Key Cryptography, Key Management, Message, 7 hours Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange.
Unit IV: Authentication and Hash Function 7 hours Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard.

Unit V: IP Security, Web Security and System Security **10 hours** IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management. Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS);Secure Electronic Transaction (SET), Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Computer Networks				
Course Code	**BSCS2430**				
Prerequisite	Fundamental of Networks				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. To understand the protocol layering and physical level communication.
2. To analyze the performance of a network.
3. To understand the various components required to build different networks.
4. To learn the functions of network layer and the various routing protocols.
5. To familiarize the functions and protocols of the Transport layer.

Course Outcomes:

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

CO1	Understand the basic layers and its functions in computer networks.
CO2	Evaluate the performance of a network.
CO3	Understand the basics of how data flows from one node to another.
CO4	Analyze and design routing algorithms.
CO5	Design protocols for various functions in the network.
CO6	Understand the working of various application layer protocols.

Text Books:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

References:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

Course Content:

Unit I: INTRODUCTION AND PHYSICAL LAYER 9 hours Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.
Unit II: DATA-LINK LAYER & MEDIA ACCESS 9 hours Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP – Media Access Control – Wired LANs: Ethernet – Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.
Unit III: NETWORK LAYER 9 hours

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.
Unit IV: TRANSPORT LAYER **9 hours** Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.
Unit V: APPLICATION LAYER **9hours** WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Software Engineering				
Course Code	BSCS2440				
Prerequisite	Fundamental of OS.				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the phases in a software project
2. To understand fundamental concepts of requirements engineering and Analysis Modeling.
3. To understand the various software design methodologies
4. To learn various testing and maintenance measures.

Course Outcomes:

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

CO1	Identify the key activities in managing a software project.
CO2	Compare different process models.
CO3	Concepts of requirements engineering and Analysis Modeling.
CO4	Apply systematic procedure for software design and deployment.
CO5	Compare and contrast the various testing and maintenance.
CO6	Manage project schedule, estimate project cost and effort required.

Text Books:

1. Roger S. Pressman, ―Software Engineering – A Practitioner‟s Approach‖, Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Ian Sommerville, ―Software Engineering‖, 9th Edition, Pearson Education Asia, 2011.

References:

1. Rajib Mall, ―Fundamentals of Software Engineering‖, Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, ―Software Engineering, A Precise Approach‖, Wiley India, 2010.
3. Kelkar S.A., ―Software Engineering‖, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, ―Software Engineering‖, Tata McGraw-Hill Publishing Company Limited,2007.

Course Content:

Unit I: SOFTWARE PROCESS AND AGILE DEVELOPMEN 9 hours Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming-XP Process.
Unit II: REQUIREMENTS ANALYSIS AND SPECIFICATION 9 hours Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.
Unit III: SOFTWARE DESIGN 9 hours Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design -Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

Unit IV: TESTING AND MAINTENANCE **9 hours** Software testing fundamentals-Internal and external views of Testing-white box testing – basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.
Unit V: PROJECT MANAGEMENT **9 hours** Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection – Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Internet and Web Technology				
Course Code	**BSCS2450**				
Prerequisite	Java, HTML				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. To understand different Internet Technologies.
2. To learn java-specific web services architecture.

Course Outcomes:

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

CO1	Construct a basic website using HTML and Cascading Style Sheets.
CO2	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms
CO3	Develop server side programs using Servlets and JSP
CO4	Construct simple web pages in PHP and to represent data in XML format.
CO5	Use XML and web services to develop interactive web applications.

Text Books:

1. Deitel and Deitel and Nieto, Internet and World Wide Web – How to Program‖, Prentice Hall, 5th Edition, 2011.

References:

1. Stephen Wynkoop and John Burke- Running a Perfect Website‖, QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming-Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson,-Web Technologies A Computer Science Perspective‖, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., -Web Technology‖, Prentice Hall of India, 2011.
5. UttamK.Roy, -Web Technologies‖, Oxford University Press, 2011.

Course Content:

Unit I: WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9 hours

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

Unit II: CLIENT SIDE PROGRAMMING 9 hours

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions-Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

Unit III: SERVER SIDE PROGRAMMING 9 hours

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling-Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

Unit IV: PHP and XML **9 hours** An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).
Unit V: INTRODUCTION TO AJAX and WEB SERVICES **9hours** AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Artificial Intelligence and Machine Learning Using Python Lab				
Course Code	BSCS2461				
Prerequisite					
Corequisite					
Antirequisite					
	L	T	P	C	
	0	0	4	2	

Course Objectives:

1. This course introduces the basic concepts and techniques of Artificial Intelligence (AI).
2. The course aims to introduce intelligent agents and reasoning, heuristic search techniques, game playing, knowledge representation, reasoning with uncertain knowledge.

Course Outcomes:

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

CO1	Identify problems that are amenable to solution by specific AI methods
CO2	Represent knowledge in Prolog and write code for drawing inferences.
CO3	Identify appropriate AI technique for the problem at hand.
CO4	Compare strengths and weaknesses of different artificial Intelligence techniques.
CO5	Sensitive towards development of responsible Artificial Intelligence.

List of Experiments:

1. Implement Non-AI and AI Techniques

2. Implement any one Technique from the following

    a. Best First Search & A* algorithm

    b. AO* algorithm

    c. Hill Climbing

3. Implement Constraint Satisfaction Algorithm

4. Expert System in Prolog

5. Implement any two Player game.

    Simulate Blocks world problem using goal stack planning

6. Implementation of learning algorithms like Find S algorithm, Version space and the candidate elimination algorithm, list then eliminate algorithm for simple real world problems.

7. Implementation of learning algorithms like Back propagation algorithm, Support Vector Machines for real time problems.

8. Implementation of algorithms like Evaluating hypothesis accuracy, Sampling theory, Central limit theorem, hypothesis testing, for real time problems.

9. Implementation of learning algorithms like Bayesian Learning for real time problems.

10. Implementation of learning algorithms like weighted majority algorithm, Instance Based Learning: k-nearest neighbour learning, locally weighted regression for real time problems.

11. Implementation of learning algorithms like Genetic Algorithms for real time problems.

12. Implementation of learning algorithms like unsupervised or reinforcement learning for real time problems.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Cryptographic and Network Security Lab				
Course Code	**BSCS2471**				
Prerequisite	C, C++, JAVA and Python.				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

LIST OF EXPERIMENTS:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:

    1. Caesar Cipher
    2. Playfair Cipher
    3. Hill Cipher
    4. Vigenere Cipher
    5. Rail fence –row & Column Transformation

2. Implement the following algorithms

    1. DES
    2. RSA Algorithm
    3. Diffie-Hellman
    4. MD5
    5. SHA-1

3. Implement the Signature Scheme -Digital Signature Standard

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Computer Networks Lab				
Course Code	BSCS2431				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

This course covers the concepts of data communication and computer networks.

It comprises of the study of the standard models for the layered protocol architecture to communicate between autonomous computers in a network and also the main features and issues of communication protocols for different layers. Topics covered comprise of introduction to OSI and TCP/IP models also.

Course Outcomes:

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

CO1	Describe the hardware, software components of a network and their interrelations.
CO2	Compare OSI and TCP/IP network models.
CO3	Describe, analyze and compare different data link, network, and transport layer protocols.
CO4	Design/implement data link and network layer protocols in a simulated networking environment.

List of Experiments:

1. Write a socket Program for Echo/Ping/Talk commands.
2. Create a socket (TCP) between two computers and enable file transfer between them.
3. Create a socket (UDP) between two computers and enable file transfer between them.
4. Write a program to implement Remote Command Execution. (Two M/Cs may be used)
5. Write a code simulating ARP /RARP protocols.
6. Create a socket for HTTP for web page upload and download.
7. Write a program for TCP module implementation.(TCP services)
8. Write a program for File Transfer in client-server architecture using following methods. (a) RS232C (b) TCP/IP
9. Write a program to implement RMI (Remote Method Invocation)
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Shortest path routing ii. Flooding iii. Distance vector
11. Implement client in C and server in Java and initiate communication between them.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Software Engineering Lab				
Course Code	BSCS2441				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

The course introduces the students to different types of operating systems. Operating system modules such as memory management, process management and file management are covered in detail.

Course Outcomes:

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

CO1	Implement multiprogramming, multithreading concepts for a small operating system.
CO2	Create, delete, and synchronize processes for a small operating system.
CO3	Implement simple memory management techniques.
CO4	Implement CPU and disk scheduling algorithms.
CO5	Use services of modern operating system efficiently
CO6	Implement a basic file system

List of Experiments:

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors.
3. Also state the precondition, post condition and function of each use case.
4. Draw the activity diagram.
5. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
6. Draw the sequence diagram for any two scenarios.
7. Draw the collaboration diagram.
8. Draw the state chart diagram.
9. Draw the component diagram.
10. Perform forward engineering in java. (Model to code conversion)
11. Perform reverse engineering in java. (Code to Model conversion)
12. Draw the deployment diagram

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Internet and Web Technology Lab				
Course Code	**BSCS2451**				
Prerequisite	Java Language				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

This course introduces the protocols used in Internet, its architecture, and security aspect of Internet. Student will have an insight that how a search engine works and web crawls.

Course Outcomes:

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

CO1	Describe Internet, its architecture, services and protocol.
CO2	Implement a simple search engine.
CO3	Implement a web crawler.
CO4	Use JavaScript technologies to make a website highly responsive, more efficient and user friendly.

List of Experiments:

S. No	List of Experiments
1	Create a web page with the following using HTML i) To embed a map in a web page ii) To fix the hot spots in that map iii) Show all the related information when the hot spots are clicked.
2	Create a web page with the following. i) Cascading style sheets. ii) Embedded style sheets. iii) Inline style sheets. Use our college information for the web pages.
3	Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.
4	Write programs in Java using sockets to implement the following: i) HTTP request ii) FTP
5	Write programs in Java using sockets to implement the following: i) SMTP ii) POP3
6	Write a program in Java for creating simple chat application with datagram sockets and datagram packets.

7	Write programs in Java using Servlets: i) To invoke servlets from HTML forms ii) To invoke servlets from Applets
8	Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
9	Write a program to lock servlet itself to a particular server IP address and port number. It requires an init parameter key that is appropriate for its servlet IP address and port before it unlocks itself and handles a request
10	i) Session tracking using hidden form fields and Session tracking for a hit count ii) Convert the static web pages into dynamic web pages using servlets (or JSP) and cookies.
11	Implement a simple program using following frameworksi) JSP Struts Framework ii) Hibernate iii). Spring
12	Explore an application in AJAX

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Open Source Technologies				
Course Code	BSCS3510				
Prerequisite	OSS				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

The objective of this course is to utilize and contribute to open source projects.

To make the students to gain experience using open source tools, languages and frameworks to prepare for careers in software development.

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

CO1	Understand the Open source Principles and Free software
CO2	Get knowledge about the methodology and Languages used to develop open source products
CO3	Demonstrate the Infrastructure services
CO4	Ability to understand the concept of Wordpress – Moodle – Android Application Development
CO5	Acquire knowledge about open source desktop and different type of vendors.

References:

1. James Lee and Brent Ware, "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP".

Course Content:

Unit I: 9 hours Introduction: Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions
Unit II: 9 hours Introduction: Linux Essential Commands – Files System Concept – Standard Files – The Linux Security Model – Vi Editor – Patitions creation – Shell Introduction – String Processing – Investigating and Managing Processes – Network Clients – Installing Application
Unit III: 9 hours Introduction **–** Apache Explained – Starting, Stopping, and Restarting Apache – Modifying the Default Configuration – Securing Apache – Set User and Group – Consider Allowing Access to Local Documentation – Don't Allow public_html Web sites – Apache control with http access.
Unit IV: 9 hours Introduction to MY SQL **–** The Show Databases and Table – The USE command – Create Database and Tables – Describe Table – Select, Insert, Update, and Delete statement – Some Administrative detail – Table Joins – Loading and Dumping a Database.
Unit V: 9hours PHP Introduction- General Syntactic Characteristics – PHP Scripting – Commenting your code – Primitives, Operations and Expressions – PHP Variables – Operations and Expressions Control Statement – Array – Functions – Basic Form Processing – File and Folder Access – Cookies – Sessions – Database Access with PHP – MySQL – MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Advances in Databases				
Course Code	BSCS3520				
Prerequisite	DBMS				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn the modeling and design of databases.
2. To acquire knowledge on parallel and distributed databases and their applications.
3. To study the usage and applications of Object Oriented and Intelligent databases.
4. To understand the usage of advanced data models.
5. To learn emerging databases such as XML, Cloud and Big Data.
6. To acquire inquisitive attitude towards research topics in databases.

Course Outcomes:

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

CO1	To develop in-depth understanding of relational databases and skills to optimize database performance in practice.
CO2	To understand and critique on each type of databases
CO3	To design faster algorithms in solving practical database problems.
CO4	To implement intelligent databases and various data models.

Text Books:

1. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition , Pearson, 2011.
2. Thomas Cannolly and Carolyn Begg, ―Database Systems, A Practical Approach to Design, Implementation and Management, Fourth Edition, Pearson Education, 2008.

References:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, ―Database System Concepts, Sixth Edition, McGraw Hill, 2011.
2. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, ―Advanced Database Systems, Morgan Kaufmann publishers,2006.

Course Content:

Unit I: PARALLEL AND DISTRIBUTED DATABASES 9 hours Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies
Unit II: OBJECT AND OBJECT RELATIONAL DATABASES 9 hours Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

Unit III: INTELLIGENT DATABASES **9 hours** Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications-Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules-Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.
Unit IV: ADVANCED DATA MODELS **9 hours** Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models -Concurrency Control – Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining
Unit V: EMERGING TECHNOLOGIES **9hours** XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Data Mining and Data Warehousing				
Course Code	**BSCS3530**				
Prerequisite	DBMS, DISTIRBUTED SYSTEM				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

To interpret the contribution of data warehousing and data mining to the decision

1. support level of organizations To evaluate different models used for OLAP and data pre-processing
2. To categorize and carefully differentiate between situations for applying different
3. data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis

Course Outcomes:

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

CO1	Understand the data extraction and transformation techniques
CO2	List the association rule mining techniques and understand association mining to correlation analysis, constraint based association mining.
CO3	Understand operational database, warehousing and multidimensional need of data base to meet industrial needs.
CO4	Understand the components of warehousing, classification methods and clustering analysis.
CO5	Identify and understand the Business analysis, query tools and application, OLAP etc.
CO6	Be familiar with the concepts of data warehouse and data mining,
CO7	Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.

Text Books:

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.

References:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, “Data Mining Methods and Models”, Wiley-Interscience, 2006.

Course Content:

Unit I: DATA MINING **9 hours** Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.
Unit II: ASSOCIATION RULE MINING **9 hours**

Association Rule - Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining.

Unit III: CLASSIFICATION **9 hours**

Classification and Prediction – Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

Unit IV: CLUSTERING AND TRENDS IN DATA MINING **9 hours**

Cluster Analysis – Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods – Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

Unit V: DATA WAREHOUSING AND BUSINESS ANALYSIS **9 hours**

Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup and Transformation Tools –Metadata - Online Analytical Processing (OLAP) – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi relational OLAP.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Object Oriented Analysis and Design				
Course Code	BSCS3540				
Prerequisite	Data structure				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Text Book:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.

References:

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.
3. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.
4. Paul C. Jorgensen, "Software Testing:- A Craftsman‟s Approach", Third Edition, Auerbach Publications, Taylor and Francis Group, 2008.

Course Content:

Unit I: INTRODUCTION **9 hours** Unified Process – UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams.
Unit II: DESIGN PATTERNS **9 hours** GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller – Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer.
Unit III: CASE STUDY **9 hours** Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – Elaboration – Domain Models – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition.
Unit IV: APPLYING DESIGN PATTERNS **9 hours** System sequence diagrams – Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement – UML class diagrams – UML interaction diagrams – Applying GoF design patterns.
Unit V: CODING AND TESTING **9 hours** Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Microprocessor and Microcontroller				
Course Code	BSCS3550				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

The student should be made to:

1. Study the Architecture of 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.
4. Study the Architecture of 8051 microcontroller.

Course Outcomes:

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

CO1	Design and implement programs on 8086 microprocessor.
CO2	Design I/O circuits.
CO3	Design Memory Interfacing circuits
CO4	Design and implement 8051 microcontroller based systems.

Text Books:

1. D.V. Hall, Microprocessors & Interfacing, TMH, 3rd edition
2. Barry B Brey, The intel microprocessor: architecture, programming and interfacing, Prentice hall of India, New Delhi, 2003.ISBN-0138027455, 4th Edition

Reference Books:

1. Alan Clements, "Principles of Computer Hardware", Oxford University Press, 3rd Edition, 2003, ISBN-9780198564539

Course Content:

Unit I: Introduction **8 hours** History of microprocessors, Introduction of 8086, Functional diagram of 8086, Register Organization, Memory Segmentation, Programming Model, Memory addresses. Physical memory organization, signal descriptions of 8086- common function signals. Minimum and Maximum mode signals, Timing diagrams.
Unit II: Assembly Language Programming (Part-I) **7 hours** Instruction formats, addressing modes, instruction set, assembler directives, simple programs involving logical, branch and arithmetic expressions
Unit III: Assembly Language Programming (Part-II) **7 hours** Procedures: Near and Far procedures, Macros, String Manipulations, searching and sorting programs, Advanced features of Assembly language programming.
Unit IV: I/O Interface **9 hours** 8255 PPI, various modes of operation and interfacing to 8086, Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter, 8251 USART architecture and nterfacing, RS- 232.
Unit V: Interfacing with memory & Interrupts **9hours**

Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine. Introduction to DOS and BIOS interrupts, Interfacing 8259 Interrupt Controller, DMA Controller 8257.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Linux Administration				
Course Code	BSCS3560				
Prerequisite	Unix				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, student will be able to

1. To Learn the basics of Linux system administrative tasks
2. To perform the Linux file systems management and various server management

Text Books:

1. Steve Shah and Wale Soyinka " Linux Administration: A Begineer's Guide", 4th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN: 978- 0072262599.
2. Susan Lauber, Philip Sweany, Rudolf Kastl and George Hacker, "REDHAT System Administration-1 Student Work book", REDHAT Inc. 2014

Course Content:

Unit I: MANAGING FILES FROM COMMAND LINE 9 hours Linux file system hierarchy - Locating files and directories by Name - Linux file system default permissions and access - Managing Linux file system permission - Controlling new file permission and ownership.
Unit II: MONITORING AND MANAGING LINUX PROCESS AND LOGS 9 hours Linux process - Controlling Jobs - Background Process and Foreground Process - Monitoring Process Activity - Killing Processes - Reviewing syslog files.
Unit III: MANAGING LINUX USERS 9 hours User creating and management commands - . /etc/password - /etc/shadow and /etc/group - Users and access permissions – Modifying user and group attributed.
Unit IV: BOOTING, FILE SYSTEMS AND CORE SYSTEM SERVICES 9 hours Boot Loaders and init process - Enabling and Disabling Services, booting and shutting down - Managing file systems - Adding new disk - Syslog Daemon and CRON.
Unit V: SERVERS AND INTERNET SERVICES 9hours DNS: Understanding DNS and Configuring DNS - Configuring DNS Client – Virtualization - Setting Up Web Server: Understanding and Installing HTTP - Configuring Apache.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Open Source Lab				
Course Code	BSCS3511				
Prerequisite	OSS				
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

To expose students to FOSS environment and introduce them to use open source packages in open source platform.

Course Outcomes:

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

CO1	Identify and apply various Linux commands
CO2	Develop shell scripts and GUI for specific needs
CO3	Use tools like GIT
CO4	Perform basic level application deployment, kernel configuration and installation, packet management and installation etc

List of Experiments:

1. Getting started with Linux basic commands for directory operations, displaying directory structure in tree format etc.
2. Linux commands for operations such as redirection, pipes, filters, job control, changing ownership/permissions of files/links/directory.
3. Advanced linux commands curl, wget, ftp, ssh and grep
4. Shell Programming : Write shell script to show various system configuration like
   - Currently logged user and his login name
   - Your current shell
   - Your home directory
   - Your operating system type
   - Your current path setting
   - Your current working directory
   - Number of users currently logged in
5. Write shell script to show various system configurations like
   - your OS and version, release number, kernel version
   - all available shells
   - computer CPU information like processor type, speed etc
     memory information
   - hard disk information like size of hard-disk, cache memory, model etc
   - File system (Mounted)
6. Write a shell script to implement a menu driven calculator with following functions
   - Addition
   - Subtraction
   - Multiplication
   - Division
   - Modulus
7. Write a script called addnames that is to be called as follows ./addnames ulist username Here ulist is the name of the file that contains list of user names and username is a particular student's username. The script should
   - check that the correct number of arguments was received and print a message, in case the
   - number of arguments is incorrect check whether the ulist file exists and print an error message if it does no

- check whether the username already exists in the file. If the username exists, print a message stating that the name already exists. Otherwise, add the username to the end of the list.

8. Version Control System setup and usage using GIT. Try the following features.
   - Creating a repository
   - Checking out a repository
   - Adding content to the repository
   - Committing the data to a repository
   - Updating the local copy
   - Comparing different revisions
   - Revert
   - Conflicts and a conflict Resolution

9. Shell script which starts on system boot up and kills every process which uses more than a specified amount of memory or CPU.

10. Introduction to packet management system : Given a set of RPM or DEB, build and maintain, and serve packages over http or ftp. Configure client systems to access the package repository.

11. Perform simple text processing using Perl, Awk.

12. Running PHP : simple applications like login forms after setting up a LAMP stack

13. Compiling from source : learn about the various build systems used like the auto* family, cmake, ant etc. instead of just running the commands. This could involve the full process like fetching from a cvs and also include autoconf, automake etc.,

14. Kernel configuration, compilation and installation : Download / access the latest kernel source code from kernel.org, compile the kernel and install it in the local system. Try to view the source code of the kernel

15. GUI Programming: Create scientific calculator – using any one of Gambas, GTK, QT

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Advances in Databases Lab				
Course Code	**BSCS3521**				
Prerequisite	DBMS				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

Upon successful completion of this lab the student of this lab will be able to:

1. Familiarize with creation of databases with constraints.
2. Understand the Control structures of PL/SQL Programming.
3. To be able to apply advanced concepts of PL/SQL like cursors, procedures and triggers.

List of experiments:

1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Procedures & Functions
10. Triggers
11. Packages

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Object Oriented Analysis and Design Lab				
Course Code	**BSCS3541**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Outcomes:

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

CO1	Perform OO analysis and design for a given problem specification.
CO2	Identify and map basic software requirements in UML mapping.
CO3	Improve the software quality using design patterns and to explain the rationale behind applying specific design patterns
CO4	Test the compliance of the software with the SRS

List of Experiments:

1. Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

    - Identify a software system that needs to be developed.
    - Document the Software Requirements Specification (SRS) for the identified system.
    - Identify use cases and develop the Use Case model.
    - Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
    - Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
    - Draw relevant State Chart and Activity Diagrams for the same system.
    - Implement the system as per the detailed design
    - Test the software system for all the scenarios identified as per the usecase diagram
    - Improve the reusability and maintainability of the software system by applying appropriate design patterns.
    - Implement the modified system and test it for various scenarios

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Microprocessor and Microcontroller Lab				
Course Code	**BSCS3551**				
Prerequisite	Fundamentals of Electronics				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

To provide a theoretical & practical introduction to microcomputer and microprocessors, assembly language programming techniques, design of hardware interfacing circuit.

Course Outcomes:

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

CO1	Solve basic arithmetic operations using the 8085 assembly language.
CO2	Write program to find out smallest/largest number stored in memory, program related to conversion from Binary to Gray code, Hexadecimal to decimal using the 8085 assembly language
CO3	Understand the Hardware and Interfacing.
CO4	Write program with 8085
CO5	Understand BCD Arithmetic, 16-Bit Data operations and Interrupts.
CO6	Interface with Data Converters
CO7	Demonstrate the concept of Programmable Interface Devices.

List of Experiments:

S.No	Program
1	ADDITION OF 2 8-BIT HEXADECIMAL NUMBERS
2	ADDITION OF 2 16-BIT HEXADECIMAL NUMBERS
3	SUBTRACTION OF 2 8-BIT HEXADECIMAL NUMBERS
4	SUBTRACTION OF 2 16-BIT HEXADECIMAL NUMBERS
5	MULTIPLICATION OF 2 8-BIT HEXADECIMAL NUMBERS
6	MULTIPLICATION OF 2 16-BIT HEXADECIMAL NUMBERS
7	DIVISION OF 2 8-BIT HEXADECIMAL NUMBERS
8	DIVISION OF 2 16-BIT HEXADECIMAL NUMBERS
9	ASCII ADDITION OF 2 DECIMAL NUMBERS
10	ASCII SUBTRACTION OF 2 DECIMAL NUMBERS
11	ASCII MULTIPLICATION OF 2 DECIMAL NUMBERS
12	ASCII DIVISION OF 2 DECIMAL NUMBERS
13	CONVERSION OF PACKED BCD TO UNPACKED BCD NUMBER

14	CONVERSION OF BCD NUMBER TO EQUIVALENT ASCII NUMBER
15	TO SORT ARRAY ELEMENTS IN AN ASCENDING ORDER
16	TRANSFER OF BLOCK OF DATA FROM ONE LOCATION TO ANOTHER
17	TO COMPARE TWO GIVEN STRINGS AND FIND OUT IF THEY ARE EQUAL OR NOT

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Linux Administration Lab				
Course Code	**BSCS3561**				
Prerequisite	C Programming, Data Structures, etc.				
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

1. To understand and make effective use of linux utilities and shell scripting language to solve problems.
2. To implement in C some standard linux utilities like mv,cp,ls etc…
3. To Develop the skills the necessary for systems programming including file system programming, process and signal management and interprocess communication
4. To develop the basic skills required to write network programs using sockets.

Course Outcomes:

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

CO1	Students will be able to understand the basic commands of linux operating system and can write shell scripts KNOWLEDGE
CO2	Students will be able to create file systems and directories and operate them UNDERSTAND
CO3	Students will be able to create processes background and fore ground etc..by fork() system calls SYNTHESIS
CO4	Students will be create shared memory segments, pipes ,message queues and can exercise inter process communication.

List of Experiments:

1. Introduction to Basic Linux Commands & Editors
2. Installation of RedHat Linux Operating System.
3. Introduction to GRUB.CONF
4. Linux System Administration
5. Setting up Linux as a Proxy server
6. Setting up Samba Server
7. Setting up Local area Network LAN Topology &Networking (TCP/IP) through manual (Statically) by using setup command or through Wizard.
8. Assigning Dynamically IP Addresses by configuring DHCP Server
9. Setting up NFS File Server
10. Creation of Any Domain Name System
11. The Apache web Server
12. Setting up FTP Server
13. Firewall & Security Configuration
14. Using gcc Compiler (Programming in C++) & Using JAVA Compiler (Execution of Simple Java Programs.& Demonstration of Implementing Socket Prog.)
15. Setting up Hardware Devices i.e. Sound card & printer
16. Working with X-Windows
    A]Switching TO A Graphical Login
    B]Setup video card,monitor and mouse for the X-server
    C]Change my default desktop to KDED] Accessing X-window remotely.
    E]Installing True Type fonts from my MSWindows partition?
    F]How do I Display and Control a Remote Desktop using VNC
17. Configuring Mail Services Using Send mail

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	**-**	**50**	**100**

Name of The Course	Human Computer Interaction				
Course Code	BSCS3001				
Prerequisite	Fundamentals of Computers and Interfaces.				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

The student should be made to:

1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for individuals and persons with disabilities
3. Learn the guidelines for user interface
4. Be aware of mobile HCI

Course Outcomes:

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

CO1	Develop meaningful user interface.
CO2	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO3	Assess the importance of user feedback
CO4	Design effective HCI for individuals and persons with disabilities.
CO5	Design effective dialog for HCI.

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O'Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009. (UNIT-V)

Course Content:

Unit I: FOUNDATIONS OF HCI 9 hours The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.
Unit II: DESIGN & SOFTWARE PROCESS 9 hours Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.
Unit III: MODELS AND THEORIES 9 hours Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.
Unit IV: MOBILE HCI 9 hours Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
Unit V: WEB INTERFACE DESIGN 9hours

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Big Data Technology				
Course Code	BSCS3002				
Prerequisite	Big Data				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

Understanding Data Science Process and learning techniques, tools, Statistical Methodologies and Machine learning algorithms used in the process.

Course Outcomes:

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

CO1	Understand & comprehend Data science problem; and should be able to provide analytical solution to it.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",
2. Wiley, ISBN: 9788126551071, 2015.
3. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
4. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
5. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
6. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
7. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013.

Course Content:

Unit I: INTRODUCTION TO BIG DATA 9 hours Introduction – distributed file system – Big Data and its importance, Four V's in bigdata, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.
Unit II: INTRODUCTION HADOOP 9 hours Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.
Unit III: HADOOP ARCHITECTURE 9 hours Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Tasktrackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.
Unit IV: HADOOP ECOSYSTEM AND YARN 9 hours Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.
Unit V: HIVE AND HIVEQL, HBASE 9hours Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Introduction to Cyber Security				
Course Code	BSCS3003				
Prerequisite	Cryptography				
Corequisite					
Antirequisite					
	L	T	P	C	
	3	0	0	3	

Course Objectives:

To select appropriate techniques to tackle and solve problems in the discipline of Cyber security management;
To know why security and its management are important for any modern organisation;

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

CO1	Gain comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources
CO2	Explain web security threats and SSL architecture
CO3	Gain knowledge about Symmetric Encryption Principles and algorithms
CO4	Know the hash functions and public key cryptography principles
CO5	Identify the threats to information security and Show how to protect information recourses
CO6	Show how to maintaining and protecting information system
CO7	Understand malicious software and have knowledge of cyber law and ethics.

References:

1. Cyber security: What You Need to Know About Computer and Cyber Security, Social Engineering, The Internet of Things + An Essential Guide to Ethical Hacking for Beginners Paperback – January 23, 2019
2. Cybersecurity: An Essential Guide to Computer and Cyber Security for Beginners, Including Ethical Hacking, Risk Assessment, Social Engineering, Attack and Defense Strategies, and Cyberwarfare, Paperback – December 11, 2018,by Lester Evans (Author)
3. CYBER SECURITY LAW THOUGHTS ON IoT, AI & BLOCKCHAIN Paperback – January 17, 2019 by PAVAN DUGGAL (Author)
4. Software-Defined Networking and Security: From Theory to Practice (Data-Enabled Engineering) 1st Edition by Dijiang Huang (Author), Ankur Chowdhary (Author), Sandeep Pisharody (Author)
5. Human-Computer Interaction and Cybersecurity Handbook (Human Factors and Ergonomics)1st Edition by Abbas Moallem (Editor)
6. Cyber Security in Organizations Paperback – September 9, 2018 by E. Fritzvold (Author), OmegaTech Series (Author)

Course Content:

Unit I: Introduction to Cyber Security **9 hours** Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace
Unit II: Cyber Security Vulnerabilities **9 hours**

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness.
Unit III: Cyber Security Safeguards **9 hours** Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.
Unit IV: Securing Web Application, Services and Servers **9 hours** Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges
Unit V: Cyberspace and the Law **9hours** Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Cloud Computing				
Course Code	**BSCS4001**				
Prerequisite	DBMS				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

This course introduces a series of current cloud computing technologies, including

1. Technologies for Infrastructure as a Service, Platform as a Service, Software as a Service and Physical Systems as a Service.
2. Objective of this course is to learn different layers of the cloud technologies, practical solutions such as Google, Amazon, Microsoft, SalesForce.com, etc. solutions as well as theoretical solutions.

Course Outcomes:

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

CO1	Define cloud computing and related concepts
CO2	Understand the key dimensions of the challenges of Cloud Computing
CO3	Understand the assessment of the economics , financial, and technological implications for selecting cloud computing for an organization
CO4	Describe the benefits of cloud computing and to understand different layers of the cloud technologies, practical solutions
CO5	Understand the challenges of cloud computing
CO6	Understand how cloud components fit together
CO7	Determine the suitability of in-house v/s hosted solutions

Reference Books:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter TATA McGraw- Hill , New Delhi - 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
3. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
4. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press
5. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christenvecctiola, S Tammarai selvi, TMH.

Course Content:

Unit I: 9 hours Cloud Computing Overview – Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service , Broad network access , Location independent resource pooling , Rapid elasticity , Measured service
Unit II: 9 hours Cloud scenarios-Benefits: scalability , simplicity , vendors ,security. Limitations – Sensitive information - Application development – Security concerns - privacy concern with a third party - security level of third party - security benefits Regularity issues: Government policies
Unit III: 9 hours **Cloud architecture**: Cloud delivery model – SPI framework , SPI evolution , SPI vs. traditional IT Model. **Software as a Service** (SaaS): SaaS service providers – Google App Engine, Salesforce.com and google platfrom – Benefits – Operational benefits - Economic benefits – Evaluating SaaS. **Platform as a Service** (PaaS): PaaS service providers – Right Scale – Salesforce.com– Rackspace –Force.com services and benefits.

Unit IV: **9 hours** **Infrastructure as a Service** (IaaS): IaaS service providers – Amazon EC2 , GoGrid – Microsoft soft implementation and support – Amazon EC service level agreement – Recent developments. Benefits **Cloud deployment model** : Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing
Unit V: **9 hours** **Virtualization**: Virtualization and cloud computing - Need of virtualization – cost , administration , fast deployment , reduce infrastructure cost – limitations. **Types of hardware virtualization**: Full virtualization - partial virtualization - para virtualization. **Desktop virtualization**: Software virtualization – Memory virtualization - Storage virtualization –Data virtualization – Network virtualization

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Distributed Systems				
Course Code	**BSCS4002**				
Prerequisite	Concurrent Computing				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.

Course Outcomes:

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

CO1	Distributed algorithms
CO2	Distributed file systems
CO3	Distributed databases
CO4	Security and protection
CO5	Distributed services such as the world-wide web, and Examples of research and commercial distributed systems.

Reference Books:

1. Pradeep. K. Sinha: " Distributed Operating Systems: Concepts and Design " , PHI, 2007.
2. George Coulour is, Jean Dollimore, Tim Kindberg: " Distributed Systems" , Concept and Design, 3rd Edition, Pearson Education, 2005.

Course Content:

Unit I: 9 hours Introduction to Distributed Computing Systems, System Models, and Issues in Designing a Distributed Operating System, Examples of distributed systems.
Unit II: 9 hours Features of Message Passing System, Synchronization and Buffering, Introduction to RPC and its models, Transparency of RPC, Implementation Mechanism, Stub Generation and RPC Messages, Server Management, Call Semantics, Communication Protocols and Client Server Binding.
Unit III: 9 hours Introduction, Design and implementation of DSM system, Granularity and Consistency Model, Advantages of DSM, Clock Synchronization, Event Ordering, Mutual exclusion, Deadlock, Election Algorithms
Unit IV: 9 hours Task Assignment Approach, Load Balancing Approach, Load Sharing Approach, Process Migration and Threads
Unit V: 9hours File Models, File Accessing Models, File Sharing Semantics, File Caching Schemes, File Replication, Atomic Transactions, Cryptography, Authentication, Access control and Digital Signatures.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Operational Research for Computer Science				
Course Code	BSCS4003				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

The aim of this course is to acquaint the students with the fundamental concepts of probability and statistics.

To provide an understanding of the processes by which real life statistical problems are analyzed.

To develop an understanding of the role of statistics in Operational Research.

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

CO1	Quantify uncertainty using probability, learn how to find probability using the concepts of random variables and distribution functions, obtain characteristics of the underlying distributions, and study functional relationships between two random variables.
CO2	Know various discrete and continuous probability distributions along with their characteristics and identify the situations where they provide realistic models.
CO3	Learn about sampling and sampling distributions along with their characteristics which will help them analyze the population or phenomenon from which the sample is drawn.
CO4	Learn inferential methods wherein the distributional form of population or phenomenon from which the sample is drawn is either known (parametric) or unknown (nonparametric).

Reference Books:

1. G. Hadley: Linear Programming. Narosa, 2002 (reprint).
2. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice, John Wiley & Sons, 2005.
3. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008.
4. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill. 2010.

Course Content:

Unit I: Introductory Linear Algebra **9 hours** System of linear equations, Matrices, Rank and Determinant of a matrix, Linearly dependent and independent vectors, Basis of a matrix.
Unit II: Linear programming – I **9 hours** Optimization Problems, Introduction to LP Formulation, Convex sets, Extreme points, Geometry of Linear Programs, Basic feasible solutions (BFS), Neighborhoods, Local and global optima, Profitable Column, Pivoting, Simplex Algorithm with initial BFS, Graphical method.
Unit III: Linear programming – II **9 hours** Degeneracy and Bland's Anticycling rule (Definition), Simplex Algorithm without initial BFS, Artificial variable techniques – two phase method, M-Charnes method, special cases in LPP.
Unit IV: Duality and Transportation Models **9 hours** Definition of the dual problem, primal-dual relationships, economic interpretation of duality, complementary slackness conditions. Transportation Algorithm, Assignment model, Hungarian Method.

Unit V: Queuing Models **9 hours**

Introduction to Queuing Models - Elements of Queuing Model, Exponential distribution, Poisson Distributions, Poisson Queuing Models, Single Server model, Multiple Server model Introduction to Markov Chains - Introduction to Markov chains, transition probabilities, classification of states, Steady state probabilities, Absorbing states

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Disruptive Technology				
Course Code	BSCS5001				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

Principles of Disruptive Technology: Evaluate your organization in light of the four Principles of Disruptive Technology to identify practices which are both productive for maximizing existing technology and anti-productive in regard to developing new technology.

Qualities of Disruptive Innovation: Apply the potential impact and role of the following variables to an analysis of your organization:

1. Coming in at the bottom of the market;
2. The extendable up-market core;
3. The significance of non-consumption; and changing metrics.

Communities of Disruptive Innovation: Evaluate and participate in at least three online resources and communities supporting Disruptive Innovation for the purpose of gathering knowledge to benefit your current organization.

Recommendations to Capture Future Markets: Develop recommendations using the four Principles of Disruptive Technology to guide your organization in developing new technologies to capture future markets.

Course Outcomes:

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

CO1	Students will learn fundamental tools to understand how to manage the dynamic aspects of technology-enabled marketplaces as a way to understand industry disruption.
CO2	They will also develop an understanding of the key elements that need to be evaluated when trying to anticipate and manage disruptive technologies in the marketplace.

Reference:

1. Carol Moran, 'Business Innovation and Disruptive Technology', Pearson Education, Inc. 2003
2. https://richtopia.com/emerging-technologies/11-disruptive-technology-examples
3. https://www.cognizant.com/whitepapers/the-future-of-it-infrastructure-codex2946.pdf

Course Content:

Unit I: Introduction & Enterprise Innovation 9 hours Introduction - Business and IT Trends - Enterprise Software Trends- Key Emerging Technology Vendors - Key Applications- ITIS Innovations - Industry 4.0
Unit II: Web Services & Peer Services 9 hours Web services Market (Technology, Business Strategy) - Peer Services Market (Technology, Business Strategy) – Web 2.0- Motion UI and Progressive Web Apps (PWA) - Hybrid Cloud – Containers (Docker, Warden, Garden)
Unit III: Real-Time Computing & Business Process Management 9 hours Real-Time Computing (Technology, Business Strategy) - Prescriptive Analytics - Edge Computing - Business Process Management (Technology- Business Strategy) - Cyber Physical Systems.

Unit IV: Mobile Business & Enterprise Security **9 hours** Wireless Infrastructure Management- Touch commerce and Personalized Shopping - Location-Based Services-Telematics- Electronic Tagging - Enterprise Security Prevention- Detection- Reaction- Estimating Results
Unit V: Future Trends **9hours** AR/VR- Digital currencies and Blockchain Technology- Intelligent Computing AI and Autonomous Robots– Data Science and Deep learning- Computer Vision – Industrial IoT

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	SOFTWARE PROJECT MANAGEMENT				
Course Code	**BSCS5002**				
Prerequisite	Software Engineering				
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. To understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle (SDLC).
3. To learn about the activity planning and risk management principles.
4. To manage software projects and control software deliverables.
5. To develop skills to manage the various phases involved in project management and people management.
6. To deliver successful software projects that support organization‘s strategic goals.

Course Outcomes:

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

CO1	Understand Project Management principles while developing software
CO2	Gain extensive knowledge about the basic project management concepts, framework and the process models.
CO3	Obtain adequate knowledge about software process models and software effort estimation techniques.
CO4	Estimate the risks involved in various project activities.
CO5	Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
CO6	Learn staff selection process and the issues related to people management.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

Course Content:

Unit I: PROJECT EVALUATION AND PROJECT PLANNING 9 hours Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.
Unit II: PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9 hours Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

Unit III: ACTIVITY PLANNING AND RISK MANAGEMENT **9 hours** Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.
Unit IV: PROJECT MANAGEMENT AND CONTROL **9 hours** Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.
Unit V: STAFFING IN SOFTWARE PROJECTS **9 hours** Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Internet of Things				
Name of the Course	**Internet of Things**				
Course Code	**BSCS5003**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

Course Outcomes:

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

CO1	Able to understand the application areas of IOT.
CO2	Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
CO3	Able to understand building blocks of Internet of Things and characteristics.

Text Boosk:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.

References:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

Course Content:

Unit I: FUNDAMENTALS OF IoT **9 hours** Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects
Unit II: **IoT PROTOCOLS** **9 hours** IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT
Unit III: DESIGN AND DEVELOPMENT **9 hours**

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.
Unit IV: DATA ANALYTICS AND SUPPORTING SERVICES 9 hours Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG
Unit V: CASE STUDIES / INDUSTRIAL APPLICATIONS 9 hours Cisco IoT system – IBM Watson IoT platform – Power Utility Industry – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Continuous Assessment Pattern:

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**