GALGOTIAS UNIVERSITY

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

School of Computing Science and Engineering

Course: B.Sc(Computer Science)

Scheme: 2020 – 2023

Curriculum

Semester 1

Sl. No	Course Code	Name of the Course	L	T	P	C	IA	MTE	ETE
							Assessment Pattern		
1	BSCS1110	Discrete Mathematics	3	1	0	4	20	30	50
2	BSCS1120	Computer System Organisation	3	0	0	3	20	30	50
3	BSCS1130	Computer Programming using 'C'	3	0	0	3	20	30	50
4	PHYS1011	Applied Physics	3	0	0	3	20	30	50
5	BSCS1131	Computer Programming using 'C' Lab	0	0	2	1	70	-	30
6	BSCS1141	Computer System Organisation Lab	0	0	2	1	70	-	30
7	JAPA1001	Japanese-I	0	0	2	1	70	-	30
8	SLBC1001	Basic English	0	0	4	2	70	-	30

Semester II

Sl No	Course Code	Name of the Course	L	T	P	C	IA	MTE	ETE
							Assessment Pattern		
1	EVS 101	Environment Studies	2	1	0	3	20	30	50
2	BSCS1210	Numerical Methods for Problem solving	3	0	0	3	20	30	50
3	BSCS1220	Data Structure and Algorithms	3	0	0	3	20	30	50
4	BSCS1230	Operating Systems	3	0	0	3	20	30	50
5	BSCS1240	Object Oriented Programming with C++	3	0	0	3	20	30	50
6	BSCS1260	Introduction to Data Science	3	0	0	3	20	30	50
7	BSCS1221	Data Structures and Algorithms Lab	0	0	2	1	70	-	30
8	BSCS9011	iOS, Android APP Development Lab	0	0	4	2	70	-	30
9	BSCS1241	Object Oriented Programming with C++ Lab	0	0	2	1	70	-	30
10	BSCS1251	Application oriented programming using Python	0	0	4	2	70	-	30
11	SLBC1002	Professional Communication	2	0	2	3	70	-	30
12	JAPA1002	Japanese-II	0	0	2	1	70	-	30

Semester III

Sl No	Course Code	Name of the Course	L	T	P	C	Assessment Pattern		
							IA	MTE	ETE
1	BSCS2311	Engineering Economics and Management	3	0	0	3	20	30	50
2	BSCS2312	Database Management System	3	0	0	3	20	30	50
3	BSCS2313	Java Programming	3	0	0	3	20	30	50
4	BSCS2314	Computer Graphics	3	0	0	3	20	30	50
5	BSCS2315	Design and Analysis of Algorithms	3	0	0	3	20	30	50
6		Elective-I	3	0	0	3	20	30	50
7	LLL235	Aptitude Building	0	0	4	2	70	-	30
8	BSCS2322	Database Management System Lab	0	0	2	1	70	-	30
9	BSCS2323	Java Programming Lab	0	0	2	1	70	-	30
10	BSCS2324	Computer Graphics Lab	0	0	2	1	70	-	30
11	BSCS2325	Design and Analysis of Algorithms Lab	0	0	2	1	70	-	30
12	JAPA2301	Japanese-III	0	0	2	1	70	-	30

Semester IV

Sl No	Course Code	Name of the Course	L	T	P	C	Assessment Pattern		
							IA	MTE	ETE
1	BSCS2460	Artificial Intelligence and Machine Learning	3	0	0	3	20	30	50
2	BSCS2470	Cryptographic and Network Security	3	0	0	3	20	30	50
3	BSCS2430	Computer Networks	3	0	0	3	20	30	50
4	BSCS2440	Software Engineering	3	0	0	3	20	30	50
5	BSCS2450	Internet and Web Technology	3	0	0	3	20	30	50
6		Elective-II	3	0	0	3	20	30	50
7	LLL245	Campus-to-Corporate	0	0	4	2	70	-	30
8	BSCS2461	Artificial Intelligence and Machine Learning using Python Lab	0	0	4	2	70	-	30
9	BSCS2471	Cryptographic and Network Security Lab	0	0	2	1	70	-	30
10	BSCS2431	Computer Networks Lab	0	0	2	1	70	-	30
11	BSCS2441	Software Engineering Lab	0	0	2	1	70	-	30
12	BSCS2451	Internet and Web Technology Lab	0	0	2	1	70	-	30

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	30	50
2	BSCS3520	Advances in Databases	3	0	0	3	20	30	50
3	BSCS3530	Data Mining and Data Warehousing	3	0	0	3	20	30	50
4	BSCS3540	Object Oriented Analysis and Design	3	0	0	3	20	30	50
5	BSCS3550	Microprocessor and Microcontroller	3	0	0	3	20	30	50
6	BSCS3560	Linux Administration	3	0	0	3	20	30	50
7		Elective-III	3	0	0	3	20	30	50
8	BSCS3511	Open Source Lab	0	0	2	1	70	-	30
9	BSCS3521	Advances in Databases Lab	0	0	2	1	70	-	30
10	BSCS3541	Object Oriented Analysis and Design Lab	0	0	2	1	70	-	30
11	BSCS3551	Microprocessor and Microcontroller Lab	0	0	2	1	70	-	30
12	BSCS3561	Linux Administration Lab	0	0	2	1	70	-	30
13	BSCS3571	Project Work - 1	0	0	0	5	70	-	30

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	70	-	30

List of Electives

Bucket-1

Sl No	Course Code	Name of the Electives (Choose one)	L	T	P	C	Assessment Pattern		
							IA	MTE	ETE
1	BSCS3001	Human Computer Interaction	3	0	0	3	20	30	50
2	BSCS3002	Big Data Technology	3	0	0	3	20	30	50
3	BSCS3004	Introduction to Cyber Security	3	0	0	3	20	30	50

Bucket-2

Sl No	Course Code	Name of the Electives (Choose one)	L	T	P	C	Assessment Pattern		
							IA	MTE	ETE
1	BSCS4001	Cloud Computing	3	0	0	3	20	30	50
2	BSCS4002	Distributed Systems	3	0	0	3	20	30	50
3	BSCS4003	Operational Research for Computer Science	3	0	0	3	20	30	50

Bucket-3

Sl No	Course Code	Name of the Electives (Choose one)	L	T	P	C	Assessment Pattern		
							IA	MTE	ETE
1	BSCS5001	Disruptive Technology	3	0	0	3	20	30	50
2	BSCS5002	Software Project Management	3	0	0	3	20	30	50
3	BSCS5003	Internet of Things	3	0	0	3	20	30	50

Detailed Syllabus

Course Code: BSCS1110	Discrete Mathematics	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	1	0	4
Prerequisite/Exposure	Basic knowledge of Mathematical function				
Co-requisites					

Course Objectives

Throughout the course, students will be expected to demonstrate theirunderstanding of Discrete Mathematics by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes

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

1. Understand the concept of mathematical logic and mathematical induction.
2. Learning the concept of Combinatorics and Stack and their applications.
3. Apply the mathematical knowledge to solve the recurrence relations.
4. Understanding the concept of Graph and their applications.
5. Understanding the concept of Boolean algebra their applications.
6. Understand about the research and indexed publication.

Course Content

Unit I: Mathematical Logic   **8 lecture hours**

Introduction – Propositions – Connectives – Truth tables – Tautologies and Contradictions –Equivalences implications – Normal forms – Methods of proof rules of inference for quantifiedpropositions – Mathematical induction.

Unit II: Combinatorics   **8 lecture 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 lecture hours**

Generating function of sequences – Calculating coefficients of generating functions – Recurrencerelations – Solving recurrence relations by substitutious and generating functions – Method ofcharacteristic roots – Solution of homogenous recurrence relations.

Unit IV: Graph Theory   **8 lecture hours**

Basic concepts of graph theory – Diagraph – Paths – Reachability connectedness – Matrixrepresentation of graphs – Subgraphs– Isomorphisms trees – Properties – Directed tress – Binary trees.

Unit V: Boolean Algevra   **8 lecture hours**

Post – Hasse diagrams – Lattices – Types of Lattices – Boolean Algebra– Basic theorems –Applications.

Unit VI Research

The advances and the latest trends in the course as well as the latest applications of the areas covered in the course with latest research.

Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums.

Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas.

Text Books

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

Reference Books

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

Continuous Assessment Pattern

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

Course Code: BSCS1120	Computer System Organization	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Fundamental of Computers				
Co-requisites					

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:

1. Understand the basic organization of computer and different instruction formats and addressing modes.
2. Analyze the concept of pipelining, segment registers and pin diagram of CPU.
3. Understand and analyze various issues related to memory hierarchy.
4. Evaluate various modes of data transfer between CPU and I/O devices.
5. Examine various inter connection structures of multi processors.
6. Understand about the research and indexed publication.

Course Content

Unit I: OVERVIEW & INSTRUCTIONS   9 lecture 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 lecture hours

ALU – Addition and subtraction – Multiplication – Division – Floating Point operations.

Unit III: PROCESSOR AND CONTROL UNIT   9 lecture hours

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions..

Unit IV :PARALLELISM   9 lecture hours

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors.

Unit V: MEMORY AND I/O SYSTEMS   9 lecture 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.

Unit VI : Research

The advances and the latest trends in the course as well as the latest applications of the areas covered in the course with the latest research.

Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums.
Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas.

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

Reference Books
1. V.CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI thedition,McGraw-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.

Continuous Assessment Pattern

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

Course Code: BSCS1130	Computer Programming using 'C'	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Fundamental of Computers				
Co-requisites					

COURSE OBJECTIVE:

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:

1. Identifysituations where computational methods and computers would be useful.
2. Given a computational problem, identify and abstractthe programming task involved.
3. Approach the programming tasks using techniques learned and write pseudo-code.
4. Choose the right data representation formats based on the requirements of the problem.
5. Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
6. Write the program on a computer, edit, compile, debug, correct, recompile and run it.
7. 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.
8. Understand about the research and indexed publication.

COURSE CONTENT

UNIT I   INTRODUCTION   **8 lecture 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 lecture 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 lecture 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 lecture 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   lecture 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.

UNIT VI   RESEARCH
The advances and the latest trends in the course as well as the latest applications of the areas covered in
the course.The latest research conducted in the areas covered in the course.
Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science
and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums.
Discussion on some of the latest products available in the market based on the areas covered in the course
and patents filed in the areas.

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. YashwantKanetker, Let us C, BPB
3. Rajaraman, V., Computer Programming in C, PHI

Continuous Assessment Pattern

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

Course Code: PHYS1011	APPLIED PHYSICS		L	T	P	C
Version No. 01	Date of Approval: 01/06/2019		3	0	0	3
Prerequisite/Exposure	Physics					
Co-requisites						

COURSE OBJECTIVE:

The Objectives of Applied Physics are:

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:

1. Upon successful completion of this course, the student will be able to:
2. CO-1 Students would be able to describe the Quantum Mechanics and its applications.
3. CO-2 Students would be able to write down the band theory of Solids.
4. CO-3 to enable student to learn and to apply concepts learnt in Quantum optics in Industry and in real life.
5. CO-4 to enable students to learn the idea of **Global Positioning System (GPS)** and to explore its further applications and importance in advancement of technologies
6. CO-5 To identify the applications of electrodynamics using Maxwell equations
7. Understand about the research and indexed publication.

COURSE CONTENT:

Unit 1 –Semiconductor fundamentals   8 lecture 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 2 –Junction Theory and diodes   8 lecture 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 3 – Number system and Boolean algebra   8 lecture 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 4 –Optics   8 lecture 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 5 -LASER   8 lecture hours

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

Unit VIResearch   **8 lecture hours**

The advances and the latest trends in the course as well as the latest applications of the areas covered in the course.

The latest research conducted in the areas covered in the course.

Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums.

Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas.

Text Books

1. Kanaankano , semiconductor devices , PHI, 2005

2. S.O. Pillai, Solid state physics , New Age International Pvt Ltd, 7th edition, 2015.

3. Arthur Beiser, S RaiChoudhury, ShobhitMahajan, (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.

Continuous Assessment Pattern

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

Course Code: BSCS1131	Computer Programming using 'C' Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	C Language				
Co-requisites					

COURSE OBJECTIVE:

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 andexpressions
2. Scientific problem solving using decision making andlooping.
3. Simple programming for one dimensional and two dimensionalarrays.
4. Solving problems using Stringfunctions
5. Programs with user defined functions – Includes ParameterPassing
6. Program using Recursive Function and conversion from given programto flow chart.
7. Program using structures andunions.

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. YashwantKanetker, Let us C, BPB
3. Rajaraman, V., Computer Programming in C, PHI

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS1141	Computer System Organization Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

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 OUTCOME:

Upon successful completion of this course, students will be able to

1. Demonstrate knowledge of binary number theory, Boolean algebra and binary codes.
2. Analyze and design combinational systems using standard gates and minimization methods (such as Karnaugh maps).
3. Analyze and design combinational systems composed of standard combinational modules, such as multiplexers flip-flops,demultiplexer and decoders.
4. Demonstrate knowledge of simple synchronous sequential systems.
5. Analyze and design sequential systems composed of standard sequential modules, such as counters and registers.
6. Analyze and design simple systems composed of programmable logic, such as ROMs and PLAs.
7. 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 instructionset of 8085 along withexamples.
5. Write the working of 8085 simulators GNUsim8085 and basic architecture of 8085along with smallintroduction.
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 anumber.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code:JAPA**1001**	**JAPANESE-I**	L	T	P	C
Version No. 01	**Date of Approval: 01/06/2019**	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

1.0   Course Description

Knowledge ofJapaneseLanguageis essential andvaluableinthefieldofallengineeringstreamslikeelectrical, electronics, mechanical and civil. Knowledge ofJapanesewillhelpengineeringstudentstowiden theirhorizonsandwillopenupnewavenuesforhighereducation in Japan. ForeignLanguageTeachingwillalso make the students multi-disciplinary and not focusing only on engineeringpsubjects. Thus,itisthe steppingstonein   theprocessofcreating   professionalswith aglobaloutlookandoutreach.Inaglobalizedworld,understandingofotherculturesconstitutesanimportantcompo nentofsoft

skills.Thiscanbeenhancedbyforeignlanguageteaching.Thiswillalsopromoteaninterdisciplinaryapproachinstu dents.

2.0   Course Objectives

1. Thiscourseattemptstogivethestudentsworkingknowledgeof JapaneseLanguagewithemphasisoncommunicativecompetence.
2. Thiscoursewill focus on listeningandspeaking.
3. BasicJapanesesentenceswillbeintroducedandpracticed.
4. Sufficientvocabularywillbegiventothestudentstoconversein 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. Thiscoursewillexposethestudentstoanewculturewhichpromotesrespect for the'others'and inculcates tolerance.

3.0   Course Outcomes

1. Onthecompletionofthecourse,thestudentswillbeableto understand simple Japanese and answer question in Japanese.
2. Theywillbeableto introduce themselves in Japanese and talk on simple topics such as 'My family', 'My city' etc.
3. They will have a basic understanding of Japanesesocietyandculture.

4. Prescribed Texts

1. ShokyuuNihongo,JapaneseLanguageCenterforInternationalStudents,TokyoUniversityofforeignStudi es,Japan.
2. NihongoKananyuumon,Japanfoundation,Japan.
3. ShinNihongono KISO-1,AOTS,3ACorporation,Japan.

5.   Additional References

1.   Random HouseJapanese-English Dictionary

2.   JapaneseforBusypeople, VideoCD, AJALT, Japan.

COMMUNICATIVE JAPANESE-I (JAPL-1001)			L	T	P	C
			0	0	2	1
Sessio n No	Module	Topics	Core Reading		Additional Reference	
1 – 4	1	IntroductiontoJapanesesyllabary, VowelsandConsonants, Romaji,Hiragana,Katakana, JapaneseNumerals,Demonstrativepronouns, Greetings,Setphrases–One gaishimasu– Sumimasen,wakarimashitaPartsofbody(looka llow)			
5-8	2	1.Hajimemashite. 2.Hon no Kimochi.	LESSON 1 & 2			
9-12	3	3.korewokudasai. 4.Sochirawananjikarananji made desuka.	LESSON 3 & 4			
13- 16	4	5.Kooshi en e ikimasuka. 6.Isshoniikimasenka.	LESSON 5 & 6			

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: SLBC1001	Basic English	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

COURSE CONTENT

Unit I:Reading Writing Level 1   8   lecture 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   lecture 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 lecture 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 lecture hours

English Master- Exercises 1-10, Cambridge Advanced Learners' Dictionary.

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

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

I Year

SEMESTER-II

Course Code: EVS101	Environment Studies	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	2	1	0	3
Prerequisite/Exposure					
Co-requisites					

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

COURSE CONTENT:

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

Text Books

1.   Kurian Joseph & R. Nagendran, "Essentials of Environmental Studies", 1stEdition , 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

Continuous Assessment Pattern

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

Course Code: BSCS1210	Numerical Methods for Problem solving	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Engineering Mathematics				
Co-requisites					

COURSE OBJECTIVE:

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 OUTCOME:

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

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 Equations9 Hours

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.

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. SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

Continuous Assessment Pattern

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

Course Code: BSCS1220	Data Structure and Algorithms	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Fundamentals of Algorithms				
Co-requisites					

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:

Upon successful completion of this course, students will be able to

1. Demonstrate familiarity with major algorithms and data structures.
2. Analyze performance of algorithms and choose the appropriate data structure and algorithm design method for a specified application.
3. Determine which algorithm or data structure to use in different scenarios and be familiar with writing recursive methods.
4. 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.
5. Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
6. Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
7. Gain knowledge about B- Trees.

COURSE CONTENT:

UNIT 1 – INTRODUCTION   9

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 2 – LINKED LIST   9

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 3 – QUEUES AND TREES   9

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 4 – GRAPHS   9

Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs.

UNIT 5 – SEARCHING & SORTING   9

Searching: linear search, Binary search, Sorting: Insertion sort, Selection sort, Quick sort, Bubble sort.

TEXT BOOKS

1. Seymour Lipschutz, "Data Structures", Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines, New Delhi.
2. YedidyanLangsam, 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.

Continuous Assessment Pattern

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

Course Code: BSCS1230	**Operating Systems**	L	T	P	C
Version No. 01	**Date of Approval: 01/06/2019**	3	0	0	3
Prerequisite/Exposure	Fundamentals of Computers				
Co-requisites					

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

Upon successful completion of this course, students will be able to

1. Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
2. 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.
3. Gain knowledge about the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
4. Demonstrate the design and management concepts along with issues and challenges of main memory, virtual memory and file system.
5. Understand the types of I/O management, disk scheduling, protection and security problems faced by operating systems and how to minimize these problems.

COURSE CONTENT:

UNIT I   OPERATING SYSTEMS OVERVIEW   9

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

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, Semaphores, Monitors; CPU Scheduling and Deadlocks.

UNIT III STORAGE MANAGEMENT   9

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

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   9

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.

TEXT BOOK:

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/.

Continuous Assessment Pattern

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

Course Code: BSCS1240	Object Oriented Programming with C++	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	C Language				
Co-requisites					

COURSE OBJECTIVES:

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

COURSE OUTCOME:

Upon successful completion of this course, Student will be able to

1. Gain the basic knowledge on Object Oriented concepts.
2. Develop applications using Object Oriented Programming Concepts
3. Demonstrate the differences between traditional imperative design and objectoriented design
4. Explain class structures as fundamental, modular building blocks
5. Understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code
6. Write small/medium scale C++ programs with simple graphical user interface
7. Understand the file handling and error handling machanisms in C++
8. Get knowledge to use strings and Streams in C++
9. Implement features of object oriented programming to solve real world problems

COURSE CONTENT:

Unit – I: STRUCTURED PROGRAMMING – I   9
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
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
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
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   9

Templates – Generic Functions – Applying Generic Functions – Generic Classes - Exception handling – Standard Template Library – Container Classes – Lists – Maps – Algorithms – String.

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. YashavantKanethkar, "Let us C++", BPB Publications, 1999.
4. Bruce Eckel, "Thinking in C++", Second Edition, Pearson Education, 2001.

Continuous Assessment Pattern

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

Course Code:BSCS1260	Introduction to Data Science	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Mathematics and Statistics				
Co-requisites					

Course Objectives:

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

Course Outcomes:

After completion of this course, the students should be able to understand & comprehend Data science problem; and should be able to provide analytical solution to it.

COURSE CONTENT:

UNIT I   INTRODUCTION TO DATA SCIENCE: 9

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

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

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

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**

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

Reference Books

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. Jure Leskovec, AnandRajaraman, 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, AbhijitDasgupta, "Practical DataScience 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", Wiley, ISBN: 9788126551071, 2015.

Continuous Assessment Pattern

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

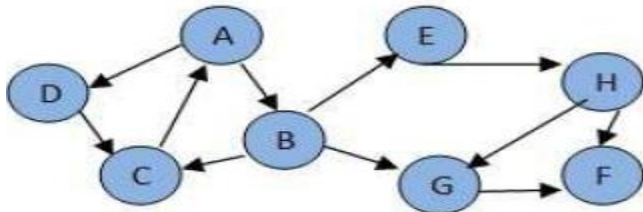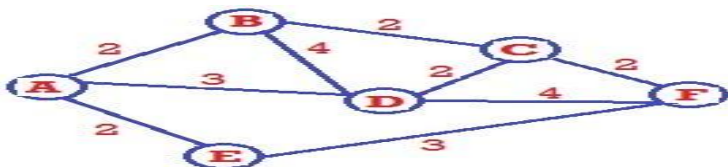| Course Code: BSCS1221	Data Structure and Algorithm Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

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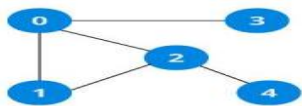
1. To develop skills to design and analyze simple linear and non linear data structures
2. To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
3. To Gain knowledge in practical applications of data structures.

COURSE OUTCOME:

Upon successful completion of this course, students will be able to

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

S.No	Topic	Pg.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.	
Value Added List of Experiments		
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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS1241	Object Oriented Programming with C++ Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	C++				
Co-requisites					

COURSE OBJECTIVE:

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

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

COURSE OUTCOME:

Upon successful completion of this course, students will be able to

1. Apply object-oriented programming features to program design and implementation
2. Understand object-oriented concepts and how they are supported by C++
3. Understand implementation issues related to object-oriented techniques.
4. Analyze, use, and create functions, classes, to overload operators.
5. Use inheritance and Pointers when creating or using classes and create templates
6. Understand and use Exception handling and file handling mechanism.

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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code:BSCS1251	Application oriented programming using Python	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	4	2
Prerequisite/Exposure	Python				
Co-requisites					

COURSE OBJECTIVE:

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

COURSE OUTCOME:

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

1. Develop Python Programs on their own
2. Understand File Processing.
3. Develop GUI.
4. Understand Client Server Programming.
5. Apply problem solving skills and implement any real world problems.

	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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: SLBC1002	**Professional Communication**	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

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:

Upon completion, successful students will be able to

1. send and interpret verbal and nonverbal messages with accuracy and effectiveness.
2. recognize differences that impact members of an organization and enact appropriate communication strategies to help attain diversity.
3. prepare personal career goals.
4. develop communication and critical thinking skills necessary for securing a job and succeeding in the diverse, ever-changing workplace.
5. demonstrate knowledge of leadership styles and approaches
6. build positive interpersonal relationships in the workplace.
7. plan and conduct an interview in both interviewee and interviewer roles.
8. distinguish groups and teams and recall communication factors that influence the effective development of teams.
9. demonstrate competence in making a decision as a team.
10. identify and overcome common obstacles in group meetings.
11. demonstrate knowledge of leadership and problem solving communication in teams.
12. create and deliver a business presentation.
13. anticipate and respond to questions during a presentation.
14. plan and create proper business documents.
15. demonstrate knowledge of research and theories regarding wellness in the workplace.
16. demonstrate awareness and knowledge of workplace ethics.
17. demonstrate knowledge of workplace and professional etiquette.

COURSE CONTENT:

Unit I:Basics of Technical Communication   9 lecture 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 lecture 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 lecture 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 lecture 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 lecture 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.

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, MeeraBanerji- 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.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: JAPA1002	Japanese-II	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	Communicative Japanese -I				
Co-requisites					

COURSE CONTENT:

1. Course Description

Knowledge ofJapaneseLanguageis essential andvaluableinthefieldofallengineering & science streams .Knowledge ofJapanesewillhelpengineeringstudentstowiden theirhorizonsandwillopenupnewavenuesforhighereducation in Japan. ForeignLanguageTeachingwillalso make the students multi-disciplinary and not focusing only on science Subjects. Thus,itisthe steppingstonein theprocessofcreating professionalswith aglobaloutlookandoutreach.Inaglobalizedworld,understandingofotherculturesconstitutesanimportantcompo nentofsoft

skills.Thiscanbeenhancedbyforeignlanguageteaching.Thiswillalsopromoteaninterdisciplinaryapproachinstu dents.

2. Course Objectives

1. Thiscourseattemptstogivethestudents a workingknowledgeof JapaneseLanguagewithemphasisoncommunicativecompetence.
2. Thiscourse will introduce reading and writing Japanese scripts, Hiragana and Katakana.
3. BasicJapanesesentenceswillbeintroducedandpracticed thoroughly.
4. Sufficientvocabularywillbegiventothestudentsto 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. Thiscoursewillexposethestudentstoanewculturewhichpromotesrespect forthe'others'and inculcates tolerance.

3. Course Outcomes

1. Oncompletionofthecourse,thestudentswillbeabletoread and write Hiragana and Katakana; speakshort sentences and answer questions in Japanese.
2. Theywill beable to read short passages written in Hiragana.
3. They will acquire a basic understandingofJapanesesocietyandculture.

4. Prescribed Texts

1. ShokyuuNihongo,JapaneseLanguageCenterforInternationalStudents,TokyoUniversityofforeignStudies ,Japan.
2. NihongoKananyuumon,Japanfoundation,Japan.
3. ShinNihongono KISO-1,AOTS,3ACorporation,Japan.

5. Additional References

1. Random HouseJapanese-English Dictionary
2. JapaneseforBusypeople, VideoCD, AJALT, Japan.

6. Pedagogy

The delivery of course will be a mix of classroom instruction, role play, conversation practice and question-answer sessions.

7.   Evaluation Scheme

Internal Assessment	Marks	External assessment	Marks
Marks based on written report (Based on continuous assessment of Lab/ Practical works, considering regularity and timely submission of lab records).	20	Written practical file	15
Regularity in carrying out Lab Examination/ practical	10	Conduction of communication by listening and test	15
Internal Viva-Voce	20	External Viva-Voce	20
Total	50	Total	50

8. Detailed Outlines of the Course

SESSION WISE INSTRUCTION PLAN

Japanese: An Introduction-II (JAPA-1002)			L	T	P	C
			0	0	2	1
Session No	Module	Topics	Core Reading		Additional Reference	
1 – 5	1	1.Gomen kudasai (audio Practice) 2.Sorosoroshitsureishimasu. (audio Practice)				
6-10	2	1.Gin-nen de. (audio Practice) 2.Chiri-- so—suwaarimasuka. (audio Practice)	LESSON-1&2			
11-15	3	1.Koreonegaishimasu. (audio Practice) 2.Omatsuriwa doo deshitaka. (audio Practice)	LESSON 3&4			
16-20	4	1.Betsubetsunionegaishimasu. (audio Practice) 2.KURIKAESU	LESSON -5 &6			

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS9011	iOS, Android APP Development Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	4	2
Prerequisite/Exposure	Java and OS				
Co-requisites					

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, the student should be able to:

1. Design and Implement various mobile applications using emulators.
2. 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)	End Term Test (ETE)	Total Marks
70	30	100

II Year

SEMESTER-III

Course Code:BSCS2310	Engineering Economics and Management	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Economics				
Co-requisites					

COURSE OUTCOMES:

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 OUTCOME:

After learning the course the students should be able to:

1. Students will describe basic concepts of Metrology.
2. Students will select linear measuring instrument for measurement of various components.
3. Students select angular and taper measurement devices for measurement of various components.
4. Students will discriminate between various screws by measuring their dimensions.
5. Students will separate different gears through measurement of various dimensions of gears.
6. Students will discriminate capabilities of machining process by measuring surface finish of the component produced
7. Students will evaluate quality of surface produced using various methods.
8. Students will describe basic concepts of mechanical measurement and errors in measurements.
9. Students will select appropriate temperature measuring device for various applications.
10. Students will describe methods of measurement for various quantities like force, torque, power, Displacement, velocity/seed and acceleration.

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: 9 hours

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.

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

Continuous Assessment Pattern

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

Course Code: BSCS2320	Database Management System	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	1	0	4
Prerequisite/Exposure	Query Languages				
Co-requisites					

COURSE OBJECTIVES

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

COURSE OUTCOME

 Upon successful completion of this course, students will be able to

1. Analyze Database design methodology.
2. Acquire knowledge in fundamentals of Data Base Management System.
3. Analyze the difference between traditional file system and DBMS.
4. Handle with different Data Base languages.
5. Draw various data models for Data Base and Write queries mathematically.
6. Design data base and normalize data and Understand how query are being processed and executed.
7. Deal with online transactions and control Concurrency.
8. Understand types of Data Base failures and Recovery.

COURSE CONTENT:

Unit I Introduction   9

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 ERModelling& SQL   9
Data Modelingusing 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
Functional dependencies-normal forms- first- second- third normal forms- BCNF- inclusion dependence-loss less join decompositions

Unit IV Transaction Processing Concept   9

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   9

Concurrency control-Locking Techniques for concurrency control-Time stamping protocols for concurrency control- validation based protocol- multiple granularity

Text Book:

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

REFERENCES:

1. RamezElmasri 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

Continuous Assessment Pattern

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

Course Code: BSCS2330	Java Programming	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Object Oriented Programming				
Co-requisites					

COURSE OBJECTIVE

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:

Upon successful completion of this course, student will be able to

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

COURSE CONTENT:

Unit I:Introduction: **9 lecture 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 lecture 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 lecture 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 lecture hours**

Exception Handling: Exceptions Exception hierarchy, Try, Catch, Finally, Throw.

Unit V: **8 lecture 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.

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 – 3rdEdition., 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.

Continuous Assessment Pattern

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

Course Code: BSCS2340	Computer Graphics	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Graphics Drawing				
Co-requisites					

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 OUTCOME:

Upon successful completion of this course, students will be able to

1. Demonstrate an understanding of contemporary graphics hardware.
2. Create interactive graphics applications in C++ using one or more graphics application programming interfaces.
3. Write program functions to implement graphics primitives.
4. Write programs that demonstrate geometrical transformations.
5. Demonstrate an understanding of the use of object hierarchy in graphics applications.
6. Write program functions to implement visibility detection.
7. Write programs that demonstrate computer graphics animation.
8. Write programs that demonstrate 2D image processing techniques.

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

TEXT BOOK:

1. Hearn D and Baker M.P, "Computer graphics – C Version", 2nd Edition, Pearson Education, 2004(unit 1, 2 & 3)
2. Ralf Steinmetz, Klarasteinmetz, "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 LeonyFernanadez, Eliar, "Multimedia Graphics", PHI, 1998.

Continuous Assessment Pattern

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

Course Code: BSCS2350	Design and Analysis of Algorithms	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	Data Structure				
Co-requisites					

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.

OUTCOMES:

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

1. Design algorithms for various computing problems.
2. Analyze the time and space complexity of algorithms.
3. Critically analyze the different algorithm design techniques for a given problem.
4. Modify existing algorithms to improve efficiency.

COURSE CONTENT:

UNIT I INTRODUCTION   9 Hrs

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 Hrs

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 Hrs

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   8 Hrs

The Simplex Method – The Maximum- Flow Problem – Maximum - Stable marriage Problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER   10 Hrs

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.

TEXT BOOKS:

1. AnanyLevitin, Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, 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.

Continuous Assessment Pattern

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

Course Code:BSCS2321	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	DBMS				
Co-requisites					

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.

OUTCOMES:

At the end of the course, the student should be able to:

1. Design and implement a database schema for a given problem-domain.
2. Populate and query a database
3. Create and maintain tables using PL/SQL.
4. 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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code:BSCS2331	Java Programming Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	Java				
Co-requisites					

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 OUTCOME

Upon successful completion of this course, students will be able to

1. Understand programming language concepts, particularly Java and object-oriented concepts.
2. Write, debug, and document well-structured Java applications.
3. Implement Java classes from specifications and effectively create and use objects from predefined class libraries.
4. Understand the behavior of primitive data types, object references, and arrays.
5. Apply decision and iteration control structures to implement algorithms.
6. Write simple recursive algorithms.
7. Implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling.

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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS2341	COMPUTER GRAPHICS LAB	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	Graphics				
Co-requisites					

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.

OUTCOMES:
At the end of the course, the student should be able to
1. Create 3D graphical scenes using open graphics library suits
2. Implement image manipulation and enhancement
3.Create 2D animations using tools

SOFTWARE: C / C++ / Java / OpenGL

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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS2351	Design and Analysis of Algorithms Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	C, C++, Java or Python Languages				
Co-requisites					

COURSE OBJECTIVE

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:

On successful completion of this course, the student will be able to:

1. Given an algorithm, identify the problem it solves.
2. 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.
3. Write proofs for correctness of algorithms.
4. Re-write a given algorithm replacing the (algorithm design) technique used with a more appropriate/efficient (algorithm design) technique.

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)	End Term Test (ETE)	Total Marks
70	30	100

II Year
SEMESTER-IV

Course Code: BSCS2460	Artificial Intelligence and Machine Learning	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Neural Networks				
Co-requisites					

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:

1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
2. Apply these techniques in applications which involve perception, reasoning and learning.
3. 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.
4. Acquire the knowledge of real world Knowledge representation.
5. Demonstrate profciency in applying scientifc method to models of machine learning.

COURSE CONTENT

Unit 1: Fundamentals of Artificial Intelligence   (9 Hrs)

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 2: Searching   (9 Hrs)

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 3: Knowledge Representation   (9Hrs)

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 4: Machine Learning Introduction and Algorithm   (9 Hrs)

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 5: Clustering Algorithm and recurrent Networks   **(9 Hrs)**

k-means algorithm, k-nearest neighbor learning, weighted majority algorithm, Hopefield Net, Hamming net, Maxnet, Kohonenself organizing map, Principal component Analysis (PCA), Applications of machine learning.

Text Books:

1. Elaine Rich and Kevin Knight: "Artificial Intelligence." Tata McGraw Hill Structure and syllabus of S.Y. B.Tech
2. Computer Engineering. Pattern A-14, A.Y. 2015-16.
3. Stuart Russell & Peter Norvig : "Artificial Intelligence : A Modern Approach", Pearson Education, 2nd Edition.
4. T. Mitchell, " Machine Learning", McGraw-Hill, 1997.
5. Anup Kumar Srivastava, Soft Computing, Alpha Science International limited. 2009.
6. 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. EthemAlpaydin, "Introduction to Machine Learning", MIT press, 2004.
6. Jacek M. Zurada, "Introduction to Artificial neural System", JAICO publishing house,2002.

Continuous Assessment Pattern

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

Course Code: BSCS2470	Cryptographic and Network Security	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Idea about Encryption and Decryption.				
Co-requisites					

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

On Completion of the course, the students should be able to:

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

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   9 hours

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

Text Books:

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

Continuous Assessment Pattern

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

Course Code: BSCS2430	Computer Networks	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Fundamental of Networks				
Co-requisites					

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.

OUTCOMES:

On Completion of the course, the students should be able to:

1. Understand the basic layers and its functions in computer networks.
2. Evaluate the performance of a network.
3. Understand the basics of how data flows from one node to another.
4. Analyze and design routing algorithms.
5. Design protocols for various functions in the network.
6. Understand the working of various application layer protocols.

COURSE CONTENT:

UNIT I   INTRODUCTION AND PHYSICAL LAYER   9

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

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

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

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V   APPLICATION LAYER   9

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

TEXT BOOK:

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.

Continuous Assessment Pattern

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

Course Code: BSCS2440	Software Engineering	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Fundamental of OS.				
Co-requisites					

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.

OUTCOMES:

On Completion of the course, the students should be able to:

1. Identify the key activities in managing a software project.
2. Compare different process models.
3. Concepts of requirements engineering and Analysis Modeling.
4. Apply systematic procedure for software design and deployment.
5. Compare and contrast the various testing and maintenance.
6. Manage project schedule, estimate project cost and effort required.

COURSE CONTENT:

UNIT I   SOFTWARE PROCESS AND AGILE DEVELOPMEN   9

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
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
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
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

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

TEXT BOOKS:

1.   Roger S. Pressman, ―Software Engineering – A Practitioner‖s Approach‖, Seventh Edition, McGraw-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. PankajJalote, ―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.

Continuous Assessment Pattern

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

Course Code: BSCS2450	Internet and Web Technology	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Java, HTML				
Co-requisites					

OBJECTIVES:

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

OUTCOMES:

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

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

COURSE CONTENT: hours

UNIT I   WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0   9

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

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

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

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   9

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.

TEXT BOOK:

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.

Continuous Assessment Pattern

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

Course Code: BSCS2461	Artificial Intelligence and Machine Learning Using Python Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

COURSE OBJECTIVE:

This course introduces the basic concepts and techniques of Artificial Intelligence (AI).

The course aims to introduce intelligent agents and reasoning, heuristic search techniques, game playing, knowledge representation, reasoning with uncertain knowledge.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

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

LIST OF PRACTICAL

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

2. Implement Constraint Satisfaction Algorithm

3. Expert System in Prolog

4. Implement any two Player game.

5. 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. Implemenstion of learning algorithms like Bayesian Learning for real time problems.

10. Implementation of learning algorithms like weighted majority algorithm, Instance BasedLearning: 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 forreal time problems.

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS2471	Cryptographic and Network Security Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	C, C++, JAVA and Python..				
Co-requisites					

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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS2431	Computer Networks Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

COURSE OBJECTIVE:

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:

On successful completion of the course, the student will be able to:

1. Describe the hardware, software components of a network and their interrelations.
2. Compare OSI and TCP/IP network models.
3. Describe, analyze and compare different data link, network, and transport layer protocols.
4. 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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS2441	Software Engineering Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

COURSE OBJECTIVE:

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:

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

1. Implement multiprogramming, multithreading concepts for a small operating system.
2. Create, delete, and synchronize processes for a small operating system.
3. Implement simple memory management techniques.
4. Implement CPU and disk scheduling algorithms.
5. Use services of modern operating system efficiently
6. Implement a basic file system.

COURSE CONTENT:

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.
   Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS2451	Internet and Web Technology Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	Java Language				
Co-requisites					

COURSE OBJECTIVE:

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:

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

1. Describe Internet, its architecture, services and protocol.
2. Implement a simple search engine.
3. Implement a web crawler.
4. Use JavaScript technologies to make a website highly responsive, more efficient and user friendly.

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 anddatagram 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)	End Term Test (ETE)	Total Marks
70	30	100

III Year

SEMESTER-V

Course Code: BSCS3510	Open Source Technologies	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	OSS				
Co-requisites					

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 OUTCOME

Upon successful completion of this course, students will be able to

1. Understand the Open source Principles and Free software
2. Get knowledge about the methodology and Languages used to develop open source products
3. Demonstrate the Infrastructure services
4. Ability to understand the concept of Wordpress – Moodle – Android Application Development
5. Acquire knowledge about open source desktop and different type of vendors

COURSE CONTENT: Hours

Unit I 9
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
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
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
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 9
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.

REFERENCES:

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

Continuous Assessment Pattern

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

Course Code: BSCS3520	**Advances in Databases**	L	T	P	C
Version No. 01	**Date of Approval: 01/06/2019**	**3**	**0**	**0**	**3**
Prerequisite/Exposure	DBMS				
Co-requisites					

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.

OUTCOMES:

Upon Completion of the course, the students will be able,

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

Course Content:

UNIT I   PARALLEL AND DISTRIBUTED DATABASES   9

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

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

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

DatalogLanguages- 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

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   9

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.

TEXT BOOKS:

1. RamezElmasri, 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.

Continuous Assessment Pattern

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

Course Code: BSCS3530	**Data Mining and Data Warehousing**	L	T	P	C
Version No. 01	**Date of Approval: 01/06/2019**	**3**	**0**	**0**	**3**
Prerequisite/Exposure	DBMS, DISTIRBUTED SYSTEM				
Co-requisites					

COURSE OBJECTIVES:

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

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

1. Understand the data extraction and transformation techniques.
2. List the association rule mining techniques and understand association mining to correlation analysis, constraint based association mining.
3. Understand operational database, warehousing and multidimensional need of data base to meet industrial needs.
4. Understand the components of warehousing, classification methods and clustering analysis.
5. Identify and understand the Business analysis, query tools and application, OLAP etc.

COURSE CONTENT: Hours

UNIT I   DATA MINING   9
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
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

 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
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

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 Multirelational OLAP.

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 MichelineKamber, "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, ShyamDiwakar 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.

Continuous Assessment Pattern

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

Course Code: BSCS3540	Object Oriented Analysis and Design	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Data structure				
Co-requisites					

COURSE CONTENT: **Hours**

UNIT I   INTRODUCTION   **9** Introduction to OOAD – Unified Process – UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams.

UNIT II   DESIGN PATTERNS   **9**
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**
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**
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**
Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing.

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.
5. **Continuous Assessment Pattern**

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

Course Code: BSCS3550	**Microprocessor and Microcontroller**	L	T	P	C
Version No. 01	**Date of Approval: 01/06/2019**	**3**	**0**	**0**	**3**
Prerequisite/Exposure					
Co-requisites					

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.

OUTCOMES:
At the end of the course, the student should be able to:

1. Design and implement programs on 8086 microprocessor.
2. Design I/O circuits.
3. Design Memory Interfacing circuits.
4. Design and implement 8051 microcontroller based systems.

Course Content:

Unit I: Introduction   **8 lecture 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 lecture 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 lecture 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 lecture 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   **9 lecture hours**
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.

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

Continuous Assessment Pattern

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

Course Code: BSCS3560	Linux Administration	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Unix.				
Co-requisites					

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

COURSE CONTENT: Hours

UNIT I   MANAGING FILES FROM COMMAND LINE   9

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

Linux process - Controlling Jobs - Background Process and Foreground Process - Monitoring Process Activity - Killing Processes - Reviewing syslog files.

UNIT III MANAGING LINUX USERS   9

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

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   9

DNS: Understanding DNS and Configuring DNS - Configuring DNS Client – Virtualization - Setting Up Web Server: Understanding and Installing HTTP - Configuring Apache.

Text Books:

1. 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
3. **Continuous Assessment Pattern**

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

Course Code: BSCS3511	Open Source Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	OSS				
Co-requisites					

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

COURSE OUTCOME:
 The students will be able to:
1. Identify and apply various Linux commands
2. Develop shell scripts and GUI for specific needs
3. Use tools like GIT
4. Perform basic level application deployment, kernel configuration and installation, packet management and installation etc

List of Exercises/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
   1. Addition
   2. Subtraction
   3. Multiplication
   4. Division
   5. Modulus
7. Write a script called addnames that is to be called as follows .
   /addnamesulist 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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code:BSCS3521	Advances in Databases Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	DBMS				
Co-requisites					

Objectives of the laboratory:

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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS3541	Object Oriented Analysis and Design Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure					
Co-requisites					

COURSE OUTCOMES

Upon completion of this course, the students will be able to:

1. Perform OO analysis and design for a given problem specification.
2. Identify and map basic software requirements in UML mapping.
3. Improve the software quality using design patterns and to explain the rationale behindapplying specific design patterns
4. Test the compliance of the software with the SRS.

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.

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

SUGGESTED DOMAINS FOR MINI-PROJECT

1. Passport automation system.
2. Book bank
3. Exam registration
4. Stock maintenance system.
5. Online course reservation system
6. Airline/Railway reservation system
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference management system

13. BPO management system
14. Library management system
15. Student information system

HARDWARE REQUIREMENTS

Standard PC

SOFTWARE REQUIREMENTS

1. Windows 7 or higher
2. ArgoUML that supports UML 1.4 and higher
3. Selenium, JUnit or Apache JMeter

Continuous Assessment Pattern

Internal Assessment (IA)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS3551	Microprocessor and Microcontroller Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	Fundamentals of Electronics				
Co-requisites					

COURSE OBJECTIVE

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

COURSE OUTCOME:

Upon successful completion of this subject, student will be able to

1. Solve basic arithmetic operations using the 8085 assembly language.
2. 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.
3. Understand the Hardware and Interfacing.
4. Write program with 8085.
5. Understand BCD Arithmetic, 16-Bit Data operations and Interrupts.
6. Interface with Data Converters
7. Demonstrate the concept of Programmable Interface Devices.

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)	End Term Test (ETE)	Total Marks
70	30	100

Course Code: BSCS3561	Linux Administration Lab	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	0	0	2	1
Prerequisite/Exposure	C Programming, Data Structures, etc.				
Co-requisites					

COURSE OBJECTIVE:

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 OUTCOME:

1. Students will be able to understand the basic commands of Linux operating system and can write shell scripts
2. Students will be able to create file systems and directories and operate them
3. Students will be able to create processes background and fore ground etc..by fork() system calls
4. Students will be create shared memory segments, pipes ,message queues and can exercise inter process communication.

Sr.No	TOPIC
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 gccCompiler (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]Changemy 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)	End Term Test (ETE)	Total Marks
70	30	100

Elective – I

Course Code: BSCS3001	Human Computer Interaction	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Fundamentals of Computers and Interfaces.				
Co-requisites					

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

OUTCOMES:

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

1. Develop meaningful user interface.
2. Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
3. Assess the importance of user feedback.
4. Design effective HCI for individuals and persons with disabilities.
5. Design effective dialog for HCI.

COURSE CONTENT: Hours

UNIT I   FOUNDATIONS OF HCI   9

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

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

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV   MOBILE HCI   9

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   9

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

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)

Continuous Assessment Pattern

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

Course Code: BSCS3002	Big Data Technology	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Big Data				
Co-requisites					

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of this course, the students should be able to understand & comprehend Data science problem; and should be able to provide analytical solution to it.

COURSE CONTENT: Hours

UNIT I   INTRODUCTION TO BIG DATA: 9

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

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

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   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: 9   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.

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. VigneshPrajapati, "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. JyLiebowitz, "Big Data and Business analytics",CRC press, 2013.

Continuous Assessment Pattern

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

Course Code: BSCS3003	Introduction to Cyber Security	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Cryptography				
Co-requisites					

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

Upon successful completion of this course, the students would be able to

1. Gain comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources.
2. Explain web security threats and SSL architecture
3. Gain knowledge about Symmetric Encryption Principles and algorithms
4. Know the hash functions and public key cryptography principles
5. Identify the threats to information security and Show how to protect information recourses
6. Show how to maintaining and protecting information system
7. Understand malicious software and have knowledge of cyber law and ethics.

COURSE CONTENT: Hours

Unit 1: Introduction to Cyber Security   9
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 2: Cyber Security Vulnerabilities   9
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 3: Cyber Security Safeguards   9
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 4: Securing Web Application, Services and Servers   9
Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

Unit 5: Cyberspace and the Law   8

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.

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), AnkurChowdhary (Author), SandeepPisharody (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)

Continuous Assessment Pattern

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

Elective – II

Course Code: BSCS4001	Cloud Computing	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	DBMS				
Co-requisites					

COURSE OBJECTIVES

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

Technologies for Infrastructure as a Service, Platform as a Service, Software as a Service and Physical Systems as a Service.

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

Upon successful completion of this course, students will be able to

1. Define cloud computing and related concepts
2. Understand the key dimensions of the challenges of Cloud Computing
3. Understand the assessment of the economics , financial, and technological implications for selecting cloud computing for an organization
4. Describe the benefits of cloud computing and to understand different layers of the cloud technologies, practical solutions
5. Understand the challenges of cloud computing
6. Understand how cloud components fit together
7. Determine the suitability of in-house v/s hosted solutions

Course Content :   **Hours**

Unit 1   **9**

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**

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**

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 googleplatfrom – 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**

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**

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.

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, ArshadeepBahga, Vijay Madisetti, University Press
5. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christenvecctiola, S Tammaraiselvi, TMH.

Continuous Assessment Pattern

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

Course Code: BSCS4002	Distributed Systems	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Concurrent Computing				
Co-requisites					

COURSE OBJECTIVE:

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

COURSE OUTCOME:

The structure of distributed systems using multiple levels of software is emphasized. Specific topics include:

1. Distributed algorithms
2. Distributed file systems
3. Distributed databases,
4. Security and protection
5. Distributed services such as the world-wide web, and Examples of research and commercial distributed systems.

COURSE CONTENT: **Hours**

UNIT I   **9**

Introduction to Distributed Computing Systems, System Models, and Issues in Designing a Distributed Operating System, Examples of distributed systems.

UNIT II   **9**

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**

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**

Task Assignment Approach, Load Balancing Approach, Load Sharing Approach, Process Migration and Threads.

UNIT V   **9**

File Models, File Accessing Models, File Sharing Semantics, File Caching Schemes, File Replication, Atomic Transactions, Cryptography, Authentication, Access control and Digital Signatures.

Reference Books

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

Continuous Assessment Pattern

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

Course Code: BSCS4003	**Operational Research for Computer Science**	L	T	P	C
Version No. 01	**Date of Approval: 01/06/2019**	**3**	**0**	**0**	**3**
Prerequisite/Exposure					
Co-requisites					

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:

Students completing this course will be able to:

1. 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.
2. Know various discrete and continuous probability distributions along with their characteristics and identify the situations where they provide realistic models.
3. 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.
4. Learn inferential methods wherein the distributional form of population or phenomenon from which the sample is drawn is either known (parametric) or unknown (nonparametric).

COURSE CONTENT: **Hours**

UNIT I: Introductory Linear Algebra   **9**

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**

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**

Degeneracy and Bland'sAnticycling 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**

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

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

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.

Continuous Assessment Pattern

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

Elective – III

Course Code: BSCS5001	**Disruptive Technology**	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure					
Co-requisites					

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; andchanging 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:

Students will learn fundamental tools to understand how to manage the dynamic aspects of technology-enabled marketplaces as a way to understand industry disruption.

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.

COURSE CONTENT:

Unit I: Introduction &Enterprise Innovation   9 lecture 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 lecture 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 lecture 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 lecture 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   9 lecture hours

AR/VR- Digital currencies and Blockchain Technology- Intelligent Computing AI and Autonomous Robots– Data Science and Deep learning- Computer Vision – Industrial IoT.

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

Continuous Assessment Pattern

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

Course Code: BSCS5002	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure	Software Engineering				
Co-requisites					

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, the students should be able to:

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

COURSE CONTENT: Hours

UNIT I PROJECT EVALUATION AND PROJECT PLANNING   9

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

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

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

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

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.

TEXT BOOK:

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.

Continuous Assessment Pattern

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

Course Code:BSCS5003	Internet of Things	L	T	P	C
Version No. 01	Date of Approval: 01/06/2019	3	0	0	3
Prerequisite/Exposure					
Co-requisites					

COURSE OBJECTIVE:

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:

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

COURSE CONTENT: Hours

UNIT I FUNDAMENTALS OF IoT 9

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

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

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

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

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.

TEXTBOOK:

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. ArshdeepBahga, 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, VlasiosTsiatsis , 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.

Continuous Assessment Pattern

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