Detailed Scheme

ACADEMIC YEAR   2018-2019

Dr. Ambedkar Institute of Technology
Bangalore

III - IV   (2017-2021 BATCH)

B.E

Department Of   Information Science and Engineering

Vision

- To create **D**ynamic, **R**esourceful, **A**dept and **I**nnovative **T**echnical professionals to meet global challenges.

Mission

- To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
- To generate new knowledge by engaging faculty and students in research, development and innovation
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
- To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

- Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

- Prepare highly capable Information Science engineers through best practices.
- Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.
- Educate students to take up social and professional responsibilities with ethical values for the betterment of the society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1: Graduates will have the ability to become successful computing professionals in the area of Information Technology.

PEO2: Graduates will be equipped to enhance their knowledge through core engineering subjects to promote lifelong learning.

PEO3: Graduates will be able to take up social, technical and entrepreneurial challenges.

PROGRAMME OUTCOMES (POs)

1. Ability to apply the knowledge of computing, mathematics, basic sciences and engineering fundamentals for the solution of engineering related problems.

2. Identify, specify and formulate comprehensive solution to complex engineering problems.

3. Design and develop computing systems to meet the specified needs of engineering problems by considering societal and environmental implications.

4. Ability to conduct experiments, analyze and interpret data to provide valid conclusions for problems in Information Science and Engineering

5. Ability to identify and solve computational problems using modern technologies and tools.

6. An understanding to assess societal, health, safety, legal issues relevant to professional engineering practices.

7. Understanding the impact of IT solutions in society and environment for sustainable development.

8. Apply and commit to professional ethics in engineering practices.

9. An ability to work as an individual, as a member and /or leader in diverse teams.

10. Ability to communicate effectively both in written and oral communication.

11. Ability to understand the importance of finance and project management as an individual and/or through team work.

12. Develop a conducive environment to engage in lifelong learning.

Academic Year 2018-2019 : III Semester

SCHEME OF TEACHING AND EXAMINATION
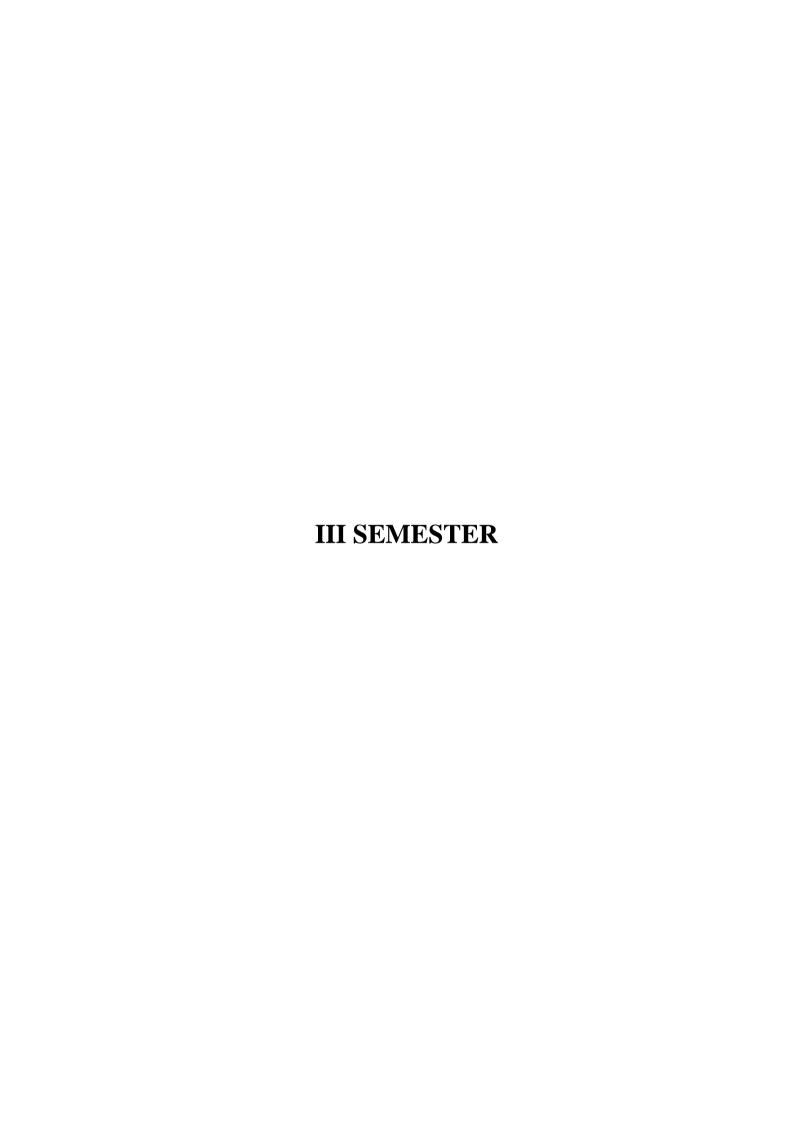**B.E. INFORMATION SCIENCE AND ENGINEERING**

S. No.	Subject Code	Subject	Teaching Dept.	Hrs/week				Examination			
				Lecture	Tutorial	Practical		Marks			
							CIE /Assignment	SEE	Credits	Total	
1	MA31IS	Discrete Mathematics and Numerical Methods	Mathematics	04			45/5	50	4	100	
2	IS31	**Computer Organization and Architecture**	ISE	**03**	**2**		45/5	50	4	100	
3	IS32	Digital principles and logic design.	ISE	04			45/5	50	4	100	
4	IS33	**Data Structures with C**	ISE	04			45/5	50	4	100	
5	IS34	Unix and Shell Programming	ISE	04			45/5	50	4	100	
6	ISL35	Data Structures with C Lab	ISE	-		3	50	50	1.5	100	
7	ISL36	Digital principles and logic design Lab	ISE	-		3	50	50	1.5	100	
8	ISL37	Unix and Shell Programming Lab	ISE	-		2	50	50	1	100	
		Total		19	02	08	400	400	24	800	

HEAD
DEPT. OF INFORMATION SCIENCE & ENGG.

Academic Year 2018-2019 : IV Semester
SCHEME OF TEACHING AND EXAMINATION
B.E. INFORMATION SCIENCE AND ENGINEERING

S. No.	Subject Code	Subject	Teaching Dept.	Hrs/week				Examination			
				Lecture	Tutorial	Practical		Marks			
							CIE /Assignment	SEE	Credits	Total
1	MA41IS	Probability, Queuing Theory and Reliability	Mathematics	04			45/5	50	4	100
2	IS41	Microprocessor and Microcontroller	ISE	04			45/5	50	4	100
3	IS42	Design and Analysis of Algorithms	ISE	03	2		45/5	50	4	100
4	IS43	Object Oriented Programming with C++	ISE	04			45/5	50	4	100
5	IS44	Graph Theory	ISE	3			45/5	50	3	100
6	IS45	Software Engineering	ISE	04			45/5	50	4	100
7	ISL46	Object Oriented Programming with C++ Lab	ISE	-		3	50	50	1.5	100
8	ISL47	Design and Analysis of Algorithms Lab	ISE			3	50	50	1.5	100
Total				22	2	6	400	400	26	800

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III SEMESTER

Sub Title: DISCRETE MATHEMATICS & NUMERICAL METHODS		
Sub Code: MA31IS	**No. of Credits:4 = 4 : 0 : 0 (L–T– P)**	**No of Lecture Hours/Week:4**
Exam Duration: 3 Hours	**Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100**	**Total No. of Contact Hours : 52**

Course Objectives:
To enhance the student's ability to think logically, mathematically and algorithmically many basic computer related concepts and provide a coherent development in the field of Discrete Structures and Numerical methods.

Unit No	Syllabus content	No of Hours
1	**Logics and Quantifiers:** Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference and Quantifiers.	10
2.	**Lattices and Boolean Algebra:** Relation and ordering, partially ordered sets, Lattices as poset, properties of lattices, Lattices as algebraic systems, sublattices, direct product and homomorphism, complete lattices, bounds of lattices, distributive lattice, and complemented lattices.	11
3.	**Groups:** Binary algebra, Semigroups and monoids, Groups, Examples and Elementary Properties, Subgroups, Homomorphisms, Isomorphisms, and Cyclic Groups, Cosets, and Lagrange's Theorem.	11
4.	**Numerical Methods-I:** Finite differences, Forward and backward differences, Newton's forward and backward interpolation formulae, Numerical differentiation. Divided differences-Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula. Numerical Solution of algebraic and transcendental equations: Secant method, Regulafalsi method, Newton - Raphson method.	10
5.	**Numerical Methods-II:** Numerical solution of ordinary differential equations of first and second order; Euler's and Modified Euler's method, Runge-Kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations).	10

Note 1: Units 2 & Unit 3 will have internal choices.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment - III from Unit 5

Course Outcomes:
After the successful completion of the course the students are able to:

CO1: Demonstrate understanding of how to read and annotate an outline of a proof and able to write a logical proof of a statement.
CO2: Create rigorous mathematical arguments to logical gates and develop an algorithm.
CO3: Apply algebraic structures in codes in cryptography.
CO4: Compare the viability of different approaches to the numerical solution of problems arising in finding roots of equations, interpolation and approximation, numerical differentiation and integration, and solution of ODE's.
CO5: Develop a variety of numerical algorithms using appropriate technology /programming languages.

COs	Mapping with POs
CO1:	PO1, PO2
CO2:	PO1, PO2
CO3:	PO1, PO2
CO4:	PO1, PO2
CO5:	PO1, PO2,PO4

TEXT BOOKS:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.
2. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill
3. B.S. Grewal, Higher Engineering Mathematics (Latest Edition, 2016), Khanna Publishers, New Delhi

REFERENCE BOOKS/WEB LINKS

1. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007.
2. D.S. Malik and M.K.Sen: Discrete Mathematical Structures: Theory and Applications, Thomson, 2004.
3. H.K.Dass and Er. RajnishVerma, Advanced Engineering Mathematics (Latest Edn, 2015), S.Chand Publisher, New Delhi.
4. Dennis G Zill, MihaelGulle, Advanced Engineering Mathematics (2ndEdn), CBS publishers.
5. N.P.Balli and Manish Goyal, A text book of Engineering Mathematics, Lakshmi Publications

Sub Title : COMPUTER ORGANIZATION AND ARCHITECTURE		
Sub Code: IS31	**No. of Credits:4=3: 2 : 0 (L-T-P)**	**No.of Lecture Hours/Week: 4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. Presents the basic structure and operation of a digital computer.
2. To understand the basics of assembly language.
3. Implement assembly programs that accomplish basic computational and I/O operations.
4. Acquire knowledge of semiconductor memories, cache memory and virtual memory.
5. Analyze the concepts of CPU Bus structures and Pipelining.

UNIT No	Syllabus Content	No of Hours
1	**Basic Structure of Computers:** Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Historical Perspective. Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language.	12
2	**Input / Output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, **Enabling** and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB	10
3	**Memory System:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories.	10
4	**Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control	10
5	**Pipelining ,Basic and intermediate concepts :** Introduction, The Major Hurdle of Pipelining , How is Pipelining Implemented ? What Makes Pipelining Hard to implement? Crosscutting Issues , Fallacies and Pitfalls.	10

Note 1: Unit 1 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
  Assignment – I from Units 1 and 2.
  Assignment – II from Units 3 and 4 .
  Assignment -III from Unit 5

Course Outcomes:

After the completion of the course students will be able to

CO1: Analyze functional units of a computer, its operational concepts, addressing modes, internal organization of a system through practicing with an assembly language

CO2:Analyze and design I/O devices, interrupts and I/O interfaces.

CO3: Analyze and design of memory unit including SRAM, DRAM, cache mapping techniques and basics of virtual memory.

CO4:Design basic processing unit and implement execution of complete instruction.

CO5: Implement basic and intermediate concepts of pipelining.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO4
CO2	PO1,PO2, PO3, PO4
CO3	PO1,PO2, PO3, PO4, PO5
CO4	PO1,PO2, PO3, PO4, PO5
CO5	PO1,PO2, PO3, PO4

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2010.
2. David A. Patterson, John L. Hennessy: Computer Organization and Design – The Hardware / Software Interface ARM Edition, 4th Edition, Elsevier, 2009.

REFERENCE BOOKS / WEBLINKS:

1. William Stallings: Computer Organization & Architecture, March ,2012.
2. Miles J. Murdocca, Vincent P. Heuring : Computer Architecture and Organization: An Integrated Approach, Elsevier, February 2007.
3. NPTEL:http://nptel.ac.in/courses/106106092/
4. http://freevideolectures.com/Course/2277/Computer-Organization#

Sub Title : DIGITAL PRINCIPLES AND LOGIC DESIGN		
Sub Code: IS32	No. of Credits:4=4: 0 : 0 (L-T-P)	No.of Lecture Hours/Week: 4
Exam Duration : 3 hours	Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100	Total No. of Contact Hours : 52

Course Objectives:
1. To understand how to work with variety of digital logic gates along with their operations using truth table and logic diagram.
2. To understand and apply minimization techniques for designing optimized digital circuits along with HDL implementation.
3. To analyze and design cost effective combinational and sequential circuits for given problems.
4. To analyze and design a synchronous and asynchronous counter.
5. To study the concept of D/A and A/D conversion.

Unit No.	Syllabus Content	No. of Hours
1	**Digital Principles:** Overview of basic gates and universal gates; Definition of digital signal, Digital Waveforms, Digital Logic, Principle of Duality, Positive and Negative Logic, Introduction to HDL. **Combinational Logic Circuits:** Sum-of-Products Method, Product-of-Sum, Karnaugh Simplifications for 4 variables, Don't-care Conditions, NAND and NOR Implementation, Simplification using Quine McClusky Method, HDL Implementation Models.	10
2	**Data-Processing Circuits:** Multiplexers, Demultiplexers, Decoders, Encoders, Magnitude Comparator, HDL Implementation of Data Processing Circuits.	09
3	**Flip-Flops:** Flip-flops: SR, JK, T, D; JK Master-slave FLIP-FLOP, Characteristic Equations, Various Representation of FLIP-FLOPs, Flip-flop conversions, HDL Implementation of Flip-flops. **Registers:** Types of Registers, Applications of Shift Registers, Register Implementation using HDL.	12
4	**Counters:** Synchronous Counters, Counter Design as a Synthesis problem, Asynchronous Counters, Counter Design using HDL.	09
5	**Design of Synchronous and Asynchronous Sequential Circuits:** Design of Synchronous Sequential Circuit: Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, State Reduction Technique. **Asynchronous Sequential Circuit:** Analysis of Asynchronous Sequential Circuit, Problems with Asynchronous Sequential Circuits, Design of Asynchronous Sequential Circuit. **D/A Conversion and A/D Conversion:** D/A Converters: Binary Ladders, 4-bit D/A Converter, D/A Accuracy and Resolution; A/D Converter: Simultaneous Conversion, Counter Method.	12

Note 1: Unit 3 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
       Assignment – I from Units 1 and 2.
       Assignment – II from Units 3 and 4 .
       Assignment -III from Unit 5

Course Outcomes:
After the completion of the course students will be able to

CO1: Comprehend the fundamental concepts and principles of digital design.
CO2: Design and analyze cost effective combinational circuits and apply concept of Minimization of Boolean functions using different methods. Implement HDL programming.
CO3: Design, analyze and implement various data processing circuits and describe behavior of various digital circuits.
CO4: Design and analyze synchronous and asynchronous sequential logic circuits using different models.
CO5: Analyze the concepts of A - D and D -A converters.

COs	Mapping with POs
CO1	PO1,PO2, PO4,PO5,PO7
CO2	PO1,PO2, PO4,PO5
CO3	PO1, PO2,PO4,PO5,
CO4	PO1,PO2,PO3, PO4,
CO5	PO1,PO2, PO4,PO5, PO7

TEXT BOOK:

Donald P Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.

REFERENCE BOOKS:

1. Stephen Brown, Zvonko Vranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005.
2. Charles H. Roth: Fundamentals of Logic Design, Jr., 5th Edition, Thomson, 2004.
3. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2007.
4. R D Sudhaker Samuel, K.S. Nandini Prasad: Logic Design, 1st edition, Elsevier Publication, 2013.

Sub Title : DATA STRUCTURES WITH C		
Sub Code:: IS33	**No. of Credits:4= 3:1:0 (L-T-P)**	**No.of Lecture Hours/Week :5**
Exam Duration : 3 hours	**Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. To become familiar with the concept of pointers and its usage in dynamic memory allocation.
2. To study and understand the implementation of common data structures.
3. To classify and comprehend the consequences of using linear data structures in implementing a system .
4. To identify the importance of non linear data structures and its usage in computer systems.

UNIT No	Syllabus Content	No of Hours
1	**Basic concepts:** Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, **Arrays and Structures:** Arrays, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Representation of Multidimensional Arrays.	12
2	**Stacks and queues:** Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues.	10
3	**Linked lists:** Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List operations, Doubly Linked Lists.	10
4	**Trees – 1:** Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees. **Trees – 2:** Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees. Introduction to Graph Data Structures.	10
5	**Priority queues** Single- and Double-Ended Priority Queues, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps. **Efficient binary search trees:** Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Splay Trees.	10

Note 1: Unit 1 & Unit 4 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
    Assignment – I from Units 1 and 2.
    Assignment – II from Units 3 and 4 .
    Assignment --III from Unit 5

Course Outcomes:
After the completion of the above course students will be able to

CO1: Implement pointers in memory allocation, data structure functions.
CO2: Classify common data structures and implement them.
CO3: Apply appropriate algorithm for problem solving after identifying the appropriate linear data structure.
CO4: Design efficient programs by choosing the most apt non linear data structure.

COs	Mapping with POs
CO1	PO3,PO4,PO7,PO9,PO10
CO2	PO2,PO3,PO4,PO9,PO12
CO3	PO2,PO3,PO4,PO9,PO12
CO4	PO2,PO3,PO4,PO9,PO12

TEXT BOOKS:
1. Horowitz, Sahni, Anderson-Freed: Fundamentals of Data Structures in C, 2nd Edition, University Press, 2007.
2. Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, 2nd Edition, Pearson Education, 2003.

REFERENCE BOOKS / WEBLINKS:
1. Debasis Samanta: Classic Data Structures, 2nd Edition, PHI, 2009.
2. Richard F. Gilberg and Behrouz A. Forouzan: Data Structures A Pseudocode Approach with C, Thomson, 2005.
3. Robert Kruse & Bruce Leung: Data Structures & Program Design in C, Pearson Education, 2007.
4. Data Structures, Seynour Lipschutz and GAV Pai, Schaum's Outlines, McGraw Hill, 2008.

Sub Title : UNIX AND SHELL PROGRAMMING		
Sub Code: IS34	**No. of Credits:4= 4 : 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week :4**
Exam Duration : 3 hours	**Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. Understand and execute the different types of unix command related to file, protection and security.
2. Develop shell programs using command substitution, positional parameters and control structures .
3. Implementation of SED and AWK commands.
4. Develop simple programs using PERL and AWK scripts.

Unit No.	Syllabus Content	No of Hours
1	Introduction. The UNIX operating system, UNIX architecture, Features of UNIX, Command usage:- locating commands, internal and external commands, Man Browsing the manual pages ,Understanding the man documentation File system: - the file, what is in a file name?, The parent child relationship ,The HOME variable: the Home directory, Pwd: checking your current directory,Cd: changing the current directory Mkdir : making directories, Rmdir: removing current directories, Absolute pathnames Relative pathnames, Ls :listing directory contents, Unix file system. Basic file attributes: Ls –l: listing file attributes, the –d option: listing directory attributes,File ownership, File permission , Chmode: changing file permission (relative and absolute method), Directory permission, changing file ownership, chown, chgrp. The vi editor: Vi basics, three modes of vi editor ,Input mode –entering and replacing text, Saving text and quitting –the ex mode,Navigation, Editing text,Undoing last editing instructions, Repeating the last command, Searching for a pattern substitution. The shell: The shells interpretive cycle, shell offering, pattern matching. Escaping and quoting: Redirection: the three standard files,/dev/null and dev/tty: two special files,Pipe, Tee: creating a tee, Command substitution, Shell variables	11
2	**The process:** Process basics, Ps:process status, System process, mechanism of process creation,Internal and external commands, Process states and Zombies, Running jobs in background,Nice: job executing with low priority, Killing processes with signals, Job control , at and batch: execute later,cron:running jobs periodically,Time: timing processes **Customizing the environment:** The shells, Environmental variables, the common environmental variables,aliases,in-line command editing , The initialization scripts. **More file attributes:** File systems and Inodes, Hard links,Symbolic links and ln, The directory,Umask: Default file and directory permission, Modification and access times,Find: locating files, **Simple filters:** The sample database, Pr:printing files,Head: displaying the beginning of a file, Tail: displaying the end of a file,Cut: slitting a file vertically,Paste : pasting files,Sort: ordering a file, Uniq: locate repeated and non repeated lines, Tr:translating characters.	11

3	**Filters using regular expression: Introduction,grep**: searching for a pattern,Basic regular expression(BRE), Extended regular expression(ERE) and egrep,**Sed:** the stream editor, Line addressing, using multiple instructions,**Context addressing**Writing selected lines to a file, Text editing,Substitution, basic regular expression **Essential shell programming:** Shell script, Read: making scripts interactive, Using command line arguments, Exit and exit status of command, Logical operator && and || - conditional execution The if conditional, Using test and [] to evaluate expressions**,** The case conditional, Expr:computation and string handling , $ 0: calling a script by different names,While: looping, For : looping with a list , Set and shift :manipulating the positional parameter,The header document , Trap :interrupting a program, Debugging shell script with set –x, Sample validation and entry scripts.	10
4	**Awk**-advanced filter: Simple awk filtering, Splitting a line into fields, Printf: formatting output,Variables and expressions, The comparison operators, Number processing,Variables, The –f option : storing awk programs in a file,The BEGIN and END section, Built in variables,Arrays, functions,Control flow – the if statement,Looping with for, Looping with while	10
5	**Perl-the master manipulator:** Perl preliminaries, The chop function, Variables and operators,The string handling functions, Specifying filenames in command line, $-: the default variable,Current line number ($.) and range operator (..), Lists and arrays, Foreach:looping through a list,Split:, join,dec2bin.pl,grep,associative arrays,Regular expressions and substitution,File handling, file tests, subroutines	10

Note 1: Unit 1 & Unit 2 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
   Assignment – I from Units 1 and 2.
   Assignment – II from Units 3 and 4 .
   Assignment --III from Unit 5

Course Outcomes:
After the completion of the above course students will be able to

 CO1: Develop simple command level codes for file, process, redirection, piping, protection and
   security
 CO2: Demonstrate the usage of shell using shell positional parameters and command substitution.
 CO3: Demonstrate different types of SED addressing and AWK filtering.
 CO4: Develop PERL programs for string usage, file concept and arrays handling.

COs	Mapping with POs
CO1	PO1, PO2,PO3,PO4
CO2	PO1,PO2,PO3,PO4,PO5
CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5,PO7

TEXT BOOK:
  UNIX –Concepts and Applications, Sumitabha Das, 4 thEdition, Tata Mc GrawHill, 2006. (Chapters 1.2, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19)

REFERENCE BOOKS:
  1. UNIX and Shell Programming, Behrouz A. Forouzan and Richard F. Gilberg, Thomson, 2005.
  2. Unix & Shell Programming, M.G. Venkateshmurthy, Pearson Education, 2005.

Sub Title : DATA STRUCTURES WITH C LAB		
Sub Code:: ISL35	No. of Credits:1.5= 0:0:1.5 (L-T-P)	No. of lecture hours/week : 3
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 = 100	

Course Objectives:

1. To understand design and implement the concept of stack using recursive techniques.
2. To Implement the application of stacks in converting an expression from infix to postfix notation and evaluate postfix expressions.
3. Design common data structures and implement linear queue, circular queue, priority queue
4. To understand the importance of implementing data structures like stacks using linked list, queues using linked list, doubly linked lists and circular linked list.
5. To traverse a non linear data structure like a Binary Search Tree.

I. LIST OF PROGRAMS

1 Write a C Program to construct a stack of integers and to perform the following operations on it: i)) Push   ii) Pop   iii) Display
The program should print appropriate messages for stack overflow, stack underflow, and stack empty

2 Write a C Program to convert and print a given valid parenthesized infix arithmetic expression to postfix expression. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide).

3 Write a C Program to evaluate a valid suffix/postfix expression using stack. Assume that the suffix/postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).

4 Write a C Program to simulate the working of a queue of integers using an array. Provide the following operations:
i) Insert   ii) Delete   iii) Display

5 Write a C Program to simulate the working of a circular queue of integers using an array. Provide the following operations:
i) Insert   ii) Delete   iii) Display

6 Write a C Program using dynamic variables and pointers, to construct a singly linked list consisting of the following information in each node: student id (integer), student name (character string) and semester (integer). The operations to be supported are:

a) The insertion operation :
 i. At the front of a list   ii. At the back of the list   iii. At any position in the list
b) Deleting a node based on student id. If the specified node is not present in the list an error message should be displayed. Both the options should be demonstrated.
c) Displaying all the nodes in the list.

7 Write a C Program using dynamic variables and pointers, to construct a singly linked list consisting of the following information in each node: student id (integer), student name (character string) and semester (integer). The operations to be supported are:

a)The insertion operation
  i. At the front of a list   ii. At the back of the list   iii. At any position in the list

b) Searching a node based on student id and update the information content. If the specified node is not present in the list an error message should be displayed. Both situations should be displayed.

c)Displaying all the nodes in the list.

8 Write a C Program using dynamic variables and pointers to construct a stack of integers using singly linked list and to perform the following operations:
      i) Push   ii) Pop   iii) Display

The program should print appropriate messages for stack overflow and stack empty.

9 Write a C program using dynamic variables and pointers to construct a queue of integers using singly linked list and to perform the following operations:
i) Insert   ii) Delete   iii) Display
The program should print appropriate messages for queue full and queue empty.

10 Write a C Program
i) To construct a binary search tree of integers.
ii) To traverse the tree and display the elements using all the methods i.e., in-order, pre-order and post-order.

II. OPEN ENDED QUESTIONS

Design and implement a solution to the following in C.

1. Write a C Program to create a sequential file with at least 5 records, each record having the structure shown below:

Sub Code	Name	Marks1	Marks2	Marks3
Non-zero positive integer	25 Characters	Positive Integer	Positive Integer	Positive Integer

Write necessary functions
  a) To display all the records in the file.
  b) To search for a specific record based on the USN. In case the record is not found, suitable message should be displayed. Both the options in this case must be demonstrated.

2. Write a C Program, which accepts the Internet Protocol (IP) address in decimal dot format (ex. 153.18.8.105) and converts it into 32-bit long integer (ex. 2568095849) using strtok library function and unions.

3. Write a C Program to support the following operations on a doubly linked list where each node consists of integers:
   a) Create a doubly linked list by adding each node at the front.
   b) Insert a new node to the left of the node whose key value is read as an input.
   c) Insert a new node to the right of the node whose key value is read as an input.
   d) Delete the node of a given data, if it is found, otherwise display appropriate message.
   e) Display the contents of the list.

NOTE:
   1. Student is permitted to submit open ended solution to any other open ended question apart from the list above . But it has to be approved by the staff in charge.

   2. In the examination each student picks one question from a lot of all 10 questions

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Course Outcomes:
After the completion of the above course students will be able to

CO1: Design and develop stack, an application providing solution to convert infix to postfix expression using stack and also design a solution to evaluate postfix expression.
CO2: Implement queues like linear queue, circular queue, priority queue .
CO3: Design and develop solution to implement the following : singly linked list, stacks using linked list, queues using linked list, doubly linked list and circular linked list.
CO4: Design the solution to traverse a Non linear data structure like a Binary Search Tree.

COs	Mapping with POs
CO1	PO2,PO3,PO4,PO7,PO9,PO12
CO2	PO3,PO4,PO7,PO9,PO12
CO3	PO2,PO3,PO4,PO7,PO9,PO12
CO4	PO3,PO4,PO7,PO9,PO12

Sub Title : DIGITAL PRINCIPLES AND LOGIC DESIGN LAB		
Sub Code:ISL36	No. of Credits:1.5=0 : 0 : 1.5 (L-T-P)	No. of lecture hours/week : 3
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 = 100	

Course Objectives:

1. Acquire basic skills and confidence to design, analyze, and implement circuits involving various digital logic gates.
2. To design, implement and analyze combinational logic circuits.
3. To design, implement and analyze sequential logic circuits.
4. Realization of one, two bit magnitude comparator.
5. Simulation and analysis of various logic circuits using VERILOG/VHDL.

I.   LIST OF EXPERIMENTS

1   a)   Realization of Binary to Gray code conversion using basic gates.
    b)   Write VHDL/Verilog code to realize all the logic gates.

2   a)   Simplification of given Boolean expression by K Map method and its realization using logic gates and/or universal gates.
    b)   Write Verilog/VHDL code to realize simplified boolean expression obtained by K map method.

3   a)   Realize full adder using 3-to-8 decoder IC and 4 input NAND gates.
    b)   Write the Verilog/VHDL code for a full adder. Simulate and verify it's working.

4   a)   Realize full subtractor using logic gates.
    b)   Write VHDL code for full subtractor. Simulate and verify its working.

5   a)   Given any 4-variable logic expression, simplify using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
    b)   Write the Verilog /VHDL code for an 8:1 multiplexer. Simulate and verify its working.

6   a)   Realize two bit magnitude comparator using basic gates.
    b)   Write Verilog /VHDL code for one bit magnitude comparator.

7   a)   Realize a J-K Master/Slave Flip-Flop using NAND gates and verify its truth table
    b)   Write the Verilog/VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify it's working.

8   a)   Design and implement mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs.
    b)   Write the Verilog/VHDL code for JK flip flop with negative triggering .Simulate and verify it's working.

9   a)   Design and implement a ring counter using 4-bit shift register.
    b)   Write the Verilog/VHDL code for switched tail counter. Simulate and verify it's working.

10 a) Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9). Display the count value on 7 segment LED display using BCD to 7 segment code converters IC.

     b) Write the Verilog/VHDL code for mod-8 up counter. Simulate and verify it's working.

II. OPEN ENDED QUESTION:

Students can build their own applications using the digital components either hardware or simulation tools (software tools)

NOTE:
1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.
2. IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 10 QUESTIONS.

Course Outcomes:
After completion of the course the students will be able to:

CO1: Simplify Boolean expressions and implement optimal Logic circuits.
CO2: Design and realize combinational circuits.
CO3: Design and realize sequential circuits used for variety of applications.
CO4: Apply minimization techniques to design and implement optimized digital circuits.
CO5: Develop HDL programs for combinational and sequential circuits.

COs	Mapping with POs
CO1	PO1,PO2, PO4,PO5 ,PO7
CO2	PO1,PO2, PO4,PO5
CO3	PO1, PO2,PO4,PO5
CO4	PO1,PO2,PO3, PO4
CO5	PO1,PO2, PO4,PO5 , PO7

Sub Title : UNIX AND SHELL PROGRAMMING LAB		
Sub Code:ISL37	**No. of Credits:1=0 : 0 : 1 (L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration : **3 hours**	**Exam Marks: CIE + SEE = 50 + 50 = 100**	

Course Objectives:
1. Understand and simulate the different types of unix command related to file, protection and security.
2. Develop shell programs using command substitution, positional parameters and control structures
3. Implementation of SED and AWK
4. Develop simple programs using PERL programming

1.a) Develop a Non-recursive shell script that accepts any number of arguments and prints them in the Reverse order, (For example,if the script named rags ,then executing rags A B C should produce C B A on standrd output).

b)Develop a shell script which accepts valid login names as command line arguments and prints their corresponding home directories. If no arguments are specified, print a suitable error message.

2.a) Design shell script to implement   terminal locking. It should prompt the user   for a password. After accepting the password entered by the user,it must   prompt again for the matching password as confirmation. The script must be   written to disgard break, Ctrl-D etc.

b) Develop a Shell script that accepts file names specified as arguments and   creates a shell script that contains these files as well as   the code to recreate these files   thus if the script generated by your script is executed   it would recreate the original files.

3.a) Using arrays develop a shell script to sort 'N' numbers using bubble sort.

b) Design script to find out whether a given string is palindrome or not.

4. a) Write shell script to generate prime numbers between given two limits.
   b) Design an awk program which will print the contents of the file /etc/passwd in the reverse order.

5. a) Write an awk script to delete duplicated lines from a text file .The order   of the original file must remain unchanged.
   b) Create an awk program which prints the alternate like 2nd ,4th ,6th ,… from the file /etc/passwd.

6.a) Write a shell script that finds and displays all the links to a file specified as the first argument to the script. The second argument which is optional can be used to specify the directory in which the search is to begin if this argument is not present the search has to   begin   in the current working directory. In either case ,the starting directory as well as all its sub directories at all   levels must be searched . the script need not include any error checking.

b) Design a shell to display the calendar for the current month with date replaced by * or **

depending on whether the date has one or two digits.

7.a) Write a Per l program to convert a unsigned binary number(supplied as argument) to decimal(for example if the argument is 10110 the output should be 22). If an argument is present ,it can be a valid binary number and if no argument is present ,the program should display an error message.

b) Write an awk script that folds long lines into 40 columns. Thus any line that exceeds 40 characters must be broken after 40th character and is to be continue with the residue. The input is to be supplied through a text file created by the user.

8. a) Develop a perl script to reverse each word in a given file.

b) Develop a perl script to check wheter a given number is palindrome or not.

III. OPEN ENDED QUESTION

Students can build their own UNIX applications using the knowledge gained form theory and practical programs.

NOTE:
1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.
2. IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 10 QUESTIONS

Course Outcomes:

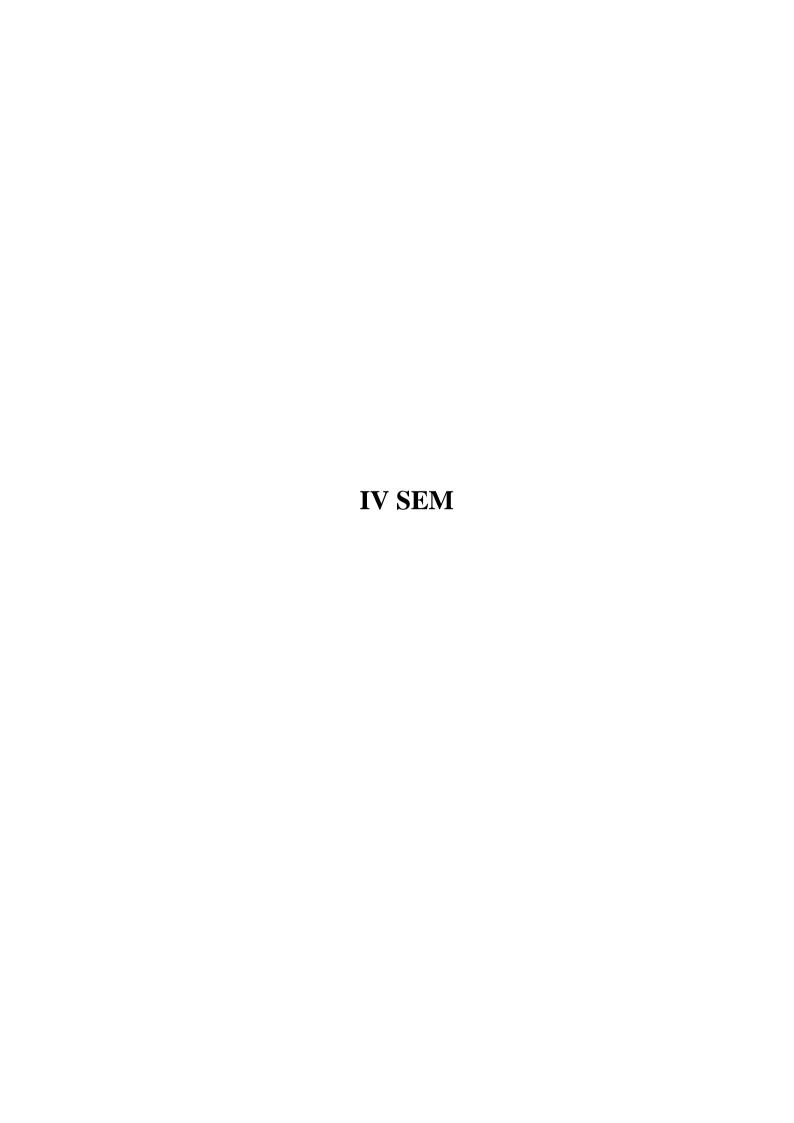After completion of the course the students will be able to:
CO1: Develop simple command level codes for file, process, redirection, piping, protection and security.
CO2: Design and Develop shell programs using shell positional parameters and command Substitution, arrays.
CO3: Develop programs using AWK filtering commands in Unix.
CO4: Design and develop PERL programs for string usage, file concept and arrays handling.

COs	Mapping with POs
CO1	PO1,PO2,PO3
CO2	PO1,PO2,PO3,PO4
CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5

IV SEM

Sub Title: PROBABILITY, QUEUEING & RELIABILITY THEORY		
Sub Code: MA41IS	No. of Credits:4 = 4 : 0 : 0 (L–T– P)	No of Lecture Hour/week: 4
Exam Duration: 3 Hours	Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100	Total No. of Contact Hours : 52

Course Objectives:
To develop analytical capability and to impart knowledge in Statistical methods and Queuing theory and their applications in Engineering and Technology, so as to enable them to apply the same for solving real world problems.

Unit No	Syllabus Content	No of Hours
1	**Probability Distributions:** Recap of random variables. Moments, Moment Generating function, Binomial distribution, Poisson distribution, Geometric distribution, Negative Binomial distribution, Exponential Distribution, Gamma distribution, Weibull distribution, and normal distribution.	10
2.	**Two Dimensional Random Variables:** Definition, joint probability mass function, marginal probability function, conditional probability function, joint probability distribution function, marginal distribution function, joint density function, marginal density function, the conditional distribution function and conditional probability density function, covariance, and correlation coefficient.	10
3.	**Random Process:** Introduction, classification of random process, methods of description of a random process, stationary, auto-correlation function, and Ergodicity,	10
4.	**Queuing Theory**: Markov Process. Poisson process, birth and death process, Markovian queuing models, M/M/1/∞/FIFO, M/M/1/N/FIFO,M/M/C/∞/FIFO, M/M/c/N/FIFO, M/G/1.	11
5.	**Reliability Engineering:** Introduction, concepts of Reliability, MTTF, MTBF, Special failure distributions-Exponential, Weibull and Normal. Exponential model in reliability. Reliability of Systems-series systems, parallel system and series-parallel. Reliability and availability of Markovian System-Availability function, Maintainability and Preventive Maintenance.	11

Note 1: Units 4 & Unit 5 will have internal choices.
Note 2 : Three Assignments are evaluated for 5 marks:
   Assignment – I from Units 1 and 2.
   Assignment – II from Units 3 and 4 .
   Assignment -III from Unit 5

Course Outcomes: After the successful completion of the course the students are able to

CO1:   Understand of basic rules of random variables and moments of random variables.
CO2:   Create probability functions of transformation of random variables and use these techniques to generate data from various distributions.
CO3:   Develop probabilities in joint probability distributions and derive the marginal and conditional distributions of bivariate random variables.
CO4:   Apply the concepts of probability theory to discrete time Markov chain and establish the Markovian queuing models.
CO5:   Illustrate the concepts of reliability in terms of probability distributions applicable to system maintainability.

COs	Mapping with POs
CO1	PO1, PO2
CO2	PO1, PO2
CO3	PO1, PO2
CO4	PO1, PO4
CO5	PO1, PO2

TEXT BOOKS:
1. Kishore S. Trivedi, .Probabilty and Statistics with Reliability, Queuing and Computer Science.
2. Richard A. Johnson, Miller and Freund's Probability and Statistics for Engineers.
3. HariBaskarn, Probabililty, Queuing theory and Reliability Engineering, Lakshmi Publications.

REFERENCE BOOKS/WEB LINKS
1. S.C.Gupta and B.K.Kapur, Fundamentals of Mathematical Statistics.
2. Robert B Cooper, Introduction to queuing theory, 2nd Edition, North Holland.
3. Ivo Adan and Jacques Resing, Queueing Systems, Lecture notes, Netherlands (2015).
4. Arnold O. Allen, Probability, Statistics and Queing theory with computer Science Applications, Academic Press, INC. New York.

Sub Title : **MICROPROCESSOR AND MICROCONTROLLER**		
Sub Code: IS41	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No.of Lecture Hours/Week: 4**
Exam Duration : 3 hours	**Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. Understand 8086 Microprocessor & 8051 Microcontroller architecture and pin configuration .

2. Analyze and code programs with different addressing modes, instructions , assembler directives of 8086.

3. Develop embedded C programs for 8051 microcontroller and run on the simulator and target board.

4. Demonstrate Programming of 8086 with I/O ports and serial communication functions of 8051 microcontroller.

Unit No..	Syllabus Content	No of Hours
1	The 8086 Processors: Introduction to microprocessor 8086 CPU Architecture-BIU and EU, Real mode memory addressing. pin functions of 8086/8088. Addressing Modes. Assembler directives: DB, DW, DD, DQ, DT, .MODEL, .DATA, .CODE, .STACK, TITLE, EQU, PTR, OFFSET, ALIGN, DUP, END, PROC, ENDP, EXTRN, GLOBAL/PUBLIC, MACRO, ENDM . Instruction set: Data transfer instructions such as MOV, LEA, XCHG, PUSH, POP, XLAT, IN and OUT. Arithmetic instructions such as ADD, ADC, SUB, SBB, INC, DEC, CMP, NEG, DAA, MUL and DIV. Example programs on these instructions. **TEXT1**	11
2	Instruction set: Logical and bit manipulation instructions such as AND, OR, XOR, NOT, TEST, ROL, RCL, ROR and RCR. Program control instructions such as JMP, JZ/JE, JNZ/JNE, JC, JNC, JAE, JBE, LOOP, LOOPE, LOOPNE, JCXZ, CALL, RET. Example programs on these instructions. String instructions SUCH AS MOVS, SCAS, CMPS, LODS, STOS, REP, REPE and REPNE. Illustration of these instructions with example programs. Machine control instructions such as STC, CLC, STD and CLD. Types of interrupts. Procedures and Macros. DOS interrupt Functions: DOS service-INT21h interrupt functions numbers 01, 02, 09, 0AH and 4CH. **TEXT1**	10
3	Introduction to 8051microcontroller : Microprocessor v/s Microcontroller, RISC v/s CISC CPU architecture and Princeton (Von Neumann) v/s Harvard architecture. Survey of Microcontrollers. Features of 8051 and its simplified block diagram. Pin diagram of 8051 and significance of the pins. Architecture of 8051: 8051 CPU and its associated registers such as A, B, SP, PC, DPTR, PSW and Memory organization. Organization of Oscillator & timing block, interrupts, timer & counters, IO pins and serial port of 8051. Addressing Modes of 8051 . Instruction set of 8051: Data transfer group of instructions Arithmetic group of instructions, Logical group of instructions, Branch control group of instructions and bit manipulation group of Instructions. Example programs on Block move with and without overlap, Block Exchange, Sorting. Example programs to find the sum of an array of one byte binary numbers / 2 digit BCD numbers . Example programs to convert BCD to binary , binary to BCD, ASCII to BCD, BCD to ASCII.	11

	TEXT3	
4	Port structures of 8051: port structures of port-0, port-1, port-2 and port-3. 8051 programming in C: Data types, time delays in 8051C, IO programming, Logical operations, data conversion programs . Timer / Counter programming in 8051: Structures of Timer / counter in different modes, Significance of TMOD and TCON registers, Timer / counters programming in assembly / 8051C. Example programs to incorporate delays in assembly / 8051C **TEXT 2**	10
5	Interrupt of 8051: Interrupt structure and their associated vector addresses. Significance of IE and IP registers. Programming of external hardware interrupts in assembly / 8051C, Programming of timer/ counter interrupts in assembly / 8051C. 8051 serial communication: Basics of serial communication, Significance of SCON register, Significance of mode-0, mode-1, mode-2 and mode-3 of Serial Communication. Programming of serial communication in assembly / 8051C. **TEXT 2**	10

Note 1: Unit 1 & Unit 3 will have internal choice
Note 2:Three Assignments are evaluated for 5 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3and 4.
Assignment -III from Unit 5

Course Outcomes:
After the completion of the above course students will be able to

CO1: Analyze the architecture of 8086
CO2: Impart the knowledge about the instruction set and addressing modes of 8086
CO3: Identify the data transfer schemes and its applications
CO4: Develop skill in simple program writing for 8086 & 8051 and applications

COs	Mapping with POs
CO1	PO1,PO5,PO6
CO2	PO1,PO2,PO3,PO4,PO6
CO3	PO2,PO4,PO5,PO6
CO4	PO2,PO3,PO6

TEXT BOOKS:
1. Barry B. Brey, "The Intel Microprocessor, Architecture, Programming and Interfacing",   8e, Pearson Education/PHI, 2013.
2 Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinley:"The8051 Microcontroller and Embedded Systems – using assembly and C"- PHI / pearson, 2009.
3.Kenneth J. Ayala:"The 8051 Microcontroller Architecture, Programming & Applications"2e, Penram International, 1996 **/** Thomson Learning 2005

REFERENCE BOOKS:
1. K. Uday Kumar, B.S. Umashankar, "Advanced microprocessors and IBM PC Assembly", TMH Publication, 6th reprint, 2000.
2. Douglas V. Hall, "Microprocessor & interfacing, programming & Hardware", 2nd Edition, TMH, 1991.
3. Dr.RamaniKalpathi and Ganesh Raja**:**"Microcontroller and its applications",Sanguine Technical Publishers-2005.
4. Y.C. Liu and G. A. Gibson, "Microcomputer systems: The 8086 / 8088 Family", 2e , PHI, 2006

Sub Title : DESIGN AND ANALYSIS OF ALGORITHMS		
Sub Code:IS42	**No. of Credits:4= 3 :1 : 0 (L-T-P)**	**No.of Lecture Hours/Week: 5**
Exam Duration : 3 hours	**Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. To introduce the concept of an algorithm and understand the techniques for its analysis.
2. To represent the algorithmic time efficiency using different asymptotic notations.
3. Explore the various algorithm design techniques, the process of its design and analysis.
4. To solve problems using appropriate design techniques.
5. Identify the limitations of algorithms power.
6. Understand concepts of space-time tradeoffs and parallel algorithms.

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** What is an Algorithm? Fundamentals of Algorithmic problem solving, Notion of Algorithm, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms. **Brute Force Approaches**: Introduction, Bubble Sort.	10
2	**Divide and conquer:** General Method, Merge Sort, Quick Sort, Defective Chess board problem. **Greedy method:** The General Method, Knapsack Problem, Job Sequencing with Deadlines, Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Path Algorithm.	12
3	**Dynamic Programming:** The General Method, Floyd's Algorithm, 0/1 Knapsack problem. **Decrease-and-conquer:** Introduction, Depth First Search, Breadth First Search, Topological Sorting. **Transform and Conquer:** Introduction, Heap sort.	10
4	**Backtracking**: n - Queens problem, Subset – Sum Problem. **Branch-and-Bound:** Assignment Problem, Traveling Salesperson Problem, Knapsack Problem. **Space-Time Tradeoffs**: Sorting by Counting, Horspool's algorithm.	12
5	**Limitations of algorithmic power and coping with them:** Decision Trees, P, NP, and NP-Complete Problems, Challenges of Numerical Algorithms. **Pram algorithms:** Introduction, Computational Model, Parallel Algorithms for Prefix Computation.	08

Note 1: Unit 2 & Unit 4   will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment - III from Unit 5

Course Outcomes:

After the completion of the above course students will be able to

CO1: Determine time efficiency of recursive and non- recursive algorithms.
CO2: Apply, analyze algorithms and solve problems using various algorithm design techniques.
CO3: Design algorithms to solve the optimization problems.
CO4: Design and analyze algorithms associated with space–time tradeoffs , understand the concepts of parallel algorithms.

COs	Mapping with POs
CO1	PO1,PO2,PO9
CO2	PO2,PO3,PO4,PO9,PO12
CO3	PO2,PO3,PO4,PO9,PO12
CO4	PO2,PO3,PO4,PO9,PO12

TEXT BOOKS:
1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Second Edition, Pearson Education, 2011.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Fundamentals of Computer Algorithms, 2nd Edition, University press, 2007

REFERENCE BOOKS / WEBLINKS:
1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 2nd Edition, PHI, 2006.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai: Introduction to the Design and Analysis of Algorithms A Strategic Approach, Tata McGraw Hill, 2005.

Sub Title : OBJECT ORIENTED PROGRAMMING WITH C++		
Sub Code:IS43	**No. of Credits:4 = 4 : 0 : 0 (L-T-P)**	**No.of Lecture Hours/Week: 4**
Exam Duration : 3 hours	**Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. Understand concepts of Object Oriented Programming and design programs using classes and objects for C++ .
2. Construct applications to provide flexible options for the creation of new definitions for some of the operators.
3. Specifying mechanism of deriving a new class from older classes through inheritance.
4. Implement methods to select appropriate member function during run time.
5. Design programs using Templates, exceptions and handle file I/Os

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** Review of structures, Programming paradigms, Overview of C++, Sample C++ program, Console I/O , variables in C++, statements, arrays and strings, pointers & user-defined types,Function Components, argument passing, inline functions, function overloading. **Classes & Objects**–I: Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Parameterized constructors, Static data members and static member Functions.	10
2	**Classes & Objects –II**: Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Copy constructors, Generic functions and classes, Applications. **Operator overloading** : operator member functions to overload +, - , pre-increment, post-increment, pre-decrement, post decrement operators , friend operator function to overload << and >> operators, Operator overloading of special operator [ ].	10
3	**Inheritance-I:** Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes. **Inheritance – II:** Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes.	10
4	**Virtual functions**: Virtual function, Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Using virtual functions. **Polymorphism:** Early and late binding. **Exception Handling:** Exception handling fundamentals, Exception handling options.	10
5	**C++ I/O System Basics :** Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members,Setting the Format Flags, Clearing Format Flags, An Overloaded Form of setf( ),Examining the Formatting Flags, Setting All Flags, Using width( ), precision( ), and fill( ), Using Manipulators to Format I/O, Overloading << and >>, Creating Your Own Inserters, Creating Your	12

	Own Extractors, Creating Your Own manipulator Functions	
	C++ File I/O: fstream> and the File Classes, Opening and Closing a File, Reading and Writing Text Files, Unformatted and Binary I/O, Characters vs. Bytes, put( ) and get( ), read( ) and write( ), More get( ) Functions, getline( ) , Detecting EOF, The ignore( ) Function, peek( ) and putback( ), flush( ), Random Access, Obtaining the Current File Position , I/O Status, Customized I/O and Files.	
	STL: An overview, containers, vectors, lists, maps.	

Note 1: Unit 1 & Unit 5 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment - III from Unit 5.

Course Outcomes:
After the completion of the above course students will be able to

CO1: Demonstrate the need of using Object Oriented Programming in the real world
      applications and design programs using classes and objects for C++.
CO2: Design and analyze programs for automatic initialization and destruction of objects.
CO3: Develop applications by providing new definitions for some of the operators.
CO4: Design and develop applications through inheritance, Virtual Base classes and dynamic
      polymorphism.
CO5: Apply concepts of Templates, Exceptions and File handling in designing programs.

COs	Mapping with POs
CO1	PO2,PO3,PO5
CO2	PO1, PO2,PO3,PO6,PO7,PO9,PO11
CO3	PO2,PO3, PO5,PO6
CO4	PO2,PO3, PO5,PO6,PO9
CO5	PO2,PO3,PO5,PO6,PO12

TEXT BOOK:

Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014

REFERENCE BOOKS:

1. Stanley B.Lippmann, Josee Lajore: C++ Primer, 4th Edition, Addison Wesley, 2005.
2. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
3. K R Venugopal, Rajkumar Buyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 1999.
4. Sourav Sahay: Object-Oriented Programming with C++, Oxford University Press, 2006.

Sub Title : GRAPH THEORY		
SubCode:IS44	No. of Credits:3=3 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week: 3
Exam Duration : 3 hours	Exam Marks: CIE + Assignment + SEE = 45 + 5 + 50 = 100	Total No. of Contact Hours : 39

Course Objectives:
1. Learn concepts of graph theory its associated theorems.
2. Study the properties of trees, applications.
3. Learn graphs applications and their usage
4. Learn distance algorithms and their applications.

UNIT No	Syllabus Content	No of Hours
1	Graphs and Graph Models, Connected Graphs, Common classes of Graphs, Multigraphs and Digraphs, the Degree of a vertex, Regular Graphs, Degree sequences, Graphs and Matrices, Isomorphism. Proofs only for the Theorems – 1.6, 1.7, 1.8, 1.11, 1.12 (Text 1)	7
2	Bridges, Trees, The minimum spanning Tree problem, The number of spanning Trees. Cut-vertices, Blocks, Connectivity, Introduction to networks, The max-Flow—Min Cut –Theorem. Proofs only for the Theorems 3.6, 4.1, 4.2, 4.3, 4,4(Text 1)	7
3	Eulerian Graphs, Hamiltonian Graphs, Chinese Postman Problem, Travelling Salesman Problem. Digraphs - Strong Digraphs, Tournaments, Decision making. Proofs only for the Theorems 6.1, 6.2, 6.6, 6.8, 7.1(Text Book 1)	9
4	Matching, Planar Graphs, Duality in planar Graphs. Coloring - The Four Color Problem, Vertex Coloring, Chromatic polynomial, Edge Coloring, Ramsey Number of Graphs. Proof only for the Theorems 9.1, 9.2, 9.3, 9.4, 9.5 (Text Book 1).	9
5	Distances – The Center of a Graph, Distant Vertices, Distances in weighted Graphs. Channel Assignment	7

Note 1: Unit 3 & Unit 4 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment - III from Unit 5

Course Outcomes:
After the completion of the above course students will be able to

CO1:Apply the concepts of graph theory, theorems and derivations.
CO2:Describe the properties of trees and their applications in Computer Science.
CO3:Use the planar graphs, coloring problems and their uses in computer Science.
CO4:Apply the distance algorithms and their applications in Computer Networks.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO9,PO10,PO12
CO2	PO1
CO3	PO1,PO2,PO3,PO9,PO10
CO4	PO1,PO2,PO3,PO9,PO10,PO12

TEXT BOOKS:
1. Introduction to Graph Theory, Gary Chartrand and Ping Zhang, Tata McGraw-Hill Edition 2006.
2. Applied and Algorithmic Graph Theory, Gary Chartrand and Ortrund R Oelerman, Mc-Graw-Hill, 1993.

REFERENCES:
Graph Theory (Graduate Texts in Mathematics), Reinhard Diestel, 3 rd Edition (2006), Springer.

Sub Title : SOFTWARE ENGINEERING		
Sub Code: IS45	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:
1. Comprehend software process, process models, activities involved in software engineering process.
2. Identify requirements engineering process and write the functional and non-function requirements.
3. Explore various design concepts using structural, object oriented designs.
4. Explore rapid software development and rapid application development.
5. Carry out software testing and formal verification and validation of software.

UNIT No.	Syllabus Content	No of Hours
1	**Overview:** FAQ's about software engineering, Professional and ethical responsibility. **Socio-Technical systems:** Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems. **Critical Systems:** Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.	12
2	**Software Processes:** Process iteration, Process activities; The Rational Unified Process; Agile methods, Plan-driven and agile development, XP, Scrum, Computer Aided Software Engineering. **Requirements:** Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document. **Requirements Engineering Processes:** Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.	10
3	**System modeling:** System Models: Context models; Behavioral models; Object models; Structured methods. **Software Design:** Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles. **Object-Oriented design:** Objects and Object Classes; An Object-Oriented design process; Object-oriented design using the UML, Design patterns Implementation issues, Design evolution.	9
4	**Development:** Rapid Software Development: Rapid application development. Open source development. **Software Evolution:** Program evolution dynamics; Software maintenance	9
5	**Verification and Validation:** Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. **Software testing:** System testing; Component testing; Test case design; Test automation. **Software Management**: Project Management; Risk management.; Teamwork; **Project planning:** software pricing; Project scheduling; Agile Planning; Estimation techniques.	12

Note 1: Unit 1 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
    Assignment – I from Units 1 and 2.
    Assignment – II from Units 3 and 4 .
    Assignment - III from Unit 5

Course Outcomes:

    CO1: Implement professional and ethical responsibility of a software engineer.
    CO2: Analyse and Design client/customer requirement.
    CO3: Design and Develop Software using Object-oriented concepts.
    CO4: Development techniques for Rapid S/W development
    CO5: Test Software using conventional verification and validation techniques and provide
        software quality assurance.

COs	Mapping with POs
CO1	PO2,PO6,PO8,PO12
CO2	PO1,PO2,PO5
CO3	PO1,PO2,PO3,PO5
CO4	PO2,PO3,PO6
CO5	PO2,PO3,PO4,PO7,PO11

TEXT BOOK:

    Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2010.

REFERENCE BOOK:

    Roger.S.Pressman: Software Engineering-A Practitioners approach, McGraw Hill,
2010.

Sub Title : **OBJECT ORIENTED PROGRAMMING WITH C++ LAB**		
Sub Code:: ISL46	**No. of Credits:1.5= 0:0:1.5 (L-T-P)**	**No. of Lecture Hours/Week: 3**
Exam Duration : 3 hours	**Exam Marks: CIE + Assignment + SEE = 50 + 50 = 100**	

Course Objectives:
1. Design programs using classes and objects for C++.
2. Build programs for automatic initialization of objects and destroy objects that are no longer required through constructors and destructors.
3. Construct applications to provide flexible options for the creation of new definitions for some of the operators.
4. Specifying mechanism of deriving a new class from older classes through inheritance.
5. Implement methods to select appropriate member function during run time.
6. Design and implement programs using Templates and Exceptions .

I. LIST OF PROGRAMS

1   Given that an EMPLOYEE class contains following members:
Data members : Employee Number, Employee Name, Basic, DA, IT, Net Salary
Member functions: to read the data, to calculate Net Salary and to print data members.
Write a C++ program to read the data of N employees and compute Net Salary of each employee.
(Dearness Allowance (DA) = 52% of Basic and Income Tax (IT) = 30% of the gross salary. Net_Salary = Basic + DA - IT)

2   Define a STUDENT class with
Data members : USN, Name, and Marks in 3 tests of a subject.
Using appropriate functions, find the average of two better marks for each student. Print the USN, Name, and the average marks of all the students. Declare an array of 10 STUDENT objects and demonstrate the functionality.

3   Write a C++ program to create a class called COMPLEX and implement the following overloading functions ADD that return a COMPLEX number.
   i.   s2 = s1. add (a) – where a is an integer (real part) and s1, s2 are complex numbers.
   ii. s3 = s1.add (s2) – where s1 ,s2 and s3 are complex numbers.

4   Create a class called STRING using dynamic memory allocation technique and implement the following operations. Display the results after every operation by overloading the operator <<.
   i.   STRING s1 = "Dr AIT"
   ii. STRING s2 = "Bangalore"
   iii. STIRNG s3 = s1 + s2 (Use copy constructor).

5   Create a template function for bubble sort and demonstrate sorting of integers and doubles.

6   Create a template class called STACK with member functions to add an element and to delete an element from the queue. Implement a stack of integers and doubles.

7   Implement the concept of operator overloading: Create a class called COMPLEX and overload + , - ,* operators to perform addition , subtraction and multiplication operations on 2 complex numbers . Also overload the operators >> and << to accept and print the complex numbers.

8   Implement the concept of operator overloading: Create a class called MATRIX using a two-dimensional array of integers. Implement the following operations by overloading the operator = = which checks the compatibility of two matrices m1 and m2 to be added and subtracted. Perform the addition and subtraction by overloading the operators + and − respectively. Display the results (sum matrix m3 and difference matrix m4) by overloading the operator <<.

    if(m1 = = m2)
    {
    m3 = m1 + m2;
    m4 = m1 − m2;
    }
    else
    display error

9   Create a class called STUDENT with data members USN, Name and Age. Using inheritance, create the classes UGSTUDENT and PGSTUDENT having fields as Semester, Fees and Stipend. Enter the data for at least 5 students. Find the semester wise average age for all UG and PG students separately.

10   Create a class called Number which has the characteristics of a decimal number.
    Derive a class OCTAL, which has the characteristics of an octal number inheriting the decimal value from the Number class.
    Derive a class HEX, which has the characteristics of an hexadecimal number inheriting the decimal value from the Number class.
    Derive a class BINARY which has the characteristics of an binary number inheriting the decimal value from the Number class.

    Implement the following operations (operator overloading).
      i.   int i = j + k where i is decimal , j is hexadecimal , k is OCTAL
      ii. int y = h + k ; where h is an OCTAL object and k is an integer.

    Display the Result by overloading the operator <<.

11   Create a class Account having data members Account No, Name, balance and member functions like input, display, deposit, withdrawal. The withdrawal function must handle an exception of type low balance.(balance should not be less than Rs 500).
    Implement try/throw/catch in C++ style.

12   Implement the concept of dynamic polymorphism to demonstrate the conversion of an expression from infix to postfix form.

Note: In the examination each student picks one question from a lot of all 12 questions.

II. OPEN ENDED QUESTIONS

Identify the different objects in the following environments and implement different suitable operations

1. Banking System
2. Library
3. Automobile Industry
4. Home Appliances
5. User Interface design   etc

NOTE:
1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY APROVED BY THE STAFF IN CHARGE.
2.IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 12 QUESTIONS

Course Outcomes:
After completing the course the students are able to:

CO1:Design programs using classes and objects using C++.
CO2: Develop programs for automatic initialization of objects and destroy objects that are no
　　longer required.
CO3: Develop applications to provide flexible options for the creation of new definitions for
　　some of the operators.
CO4:Specify mechanism of deriving a new class from older classes through inheritance .
CO5: Design a program using Templates & Exception Handling.

COs	Mapping with POs
CO1	PO2,PO3,PO5
CO2	PO2,PO3,PO6,PO9
CO3	PO2,PO3,PO5,PO6
CO4	PO2,PO3,PO5,PO9
CO5	PO2,PO3,PO5,PO6

Sub Title : DESIGN AND ANALYSIS OF ALGORITHMS LAB		
Sub Code:ISL47	No. of Credits:1.5=0 : 0 : 1.5(L-T-P)	No. of Lecture Hours/Week: 3
Exam Duration : 3 hours	Exam Marks: CIE + Assignment + SEE = 50 + 50 = 100	

Course Objectives:
1. To introduce various algorithm design techniques. 2. To design algorithms with specific technique and implement these algorithms using the appropriate technique. 3. Enhance written and oral communication skills among students. 4. To enhance the skill to debug programs

I. LIST OF PROGRAMS

Implement the following using C/C++:

1   Design and implement an algorithm to Sort a given set of elements using DAC merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n and analyze the time complexity.

2   From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

3   Apply Prim's algorithm to undirected graph and obtain minimum cost Spanning Tree.

4   Design and implement an algorithm to solve 0/1 Knapsack problem using dynamic programming.

5   a) Design and Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.

     b) Design an algorithm to compute transitive closure of a given directed graph using

       Warshall's algorithm.

6   Print all the nodes reachable from a given starting node in a digraph using BFS method.

7   Obtain the topological ordering of vertices in a given graph using DFS method/ Source removal method.

8   Design and implement Heap Sort algorithm to arrange elements in desired order.

9   Design and implement Horspool's algorithm

10   Design and implement an algorithm to solve N-Queen's problem using Back Tracking.

Note: In the examination each student picks one question from the lot of all 10 questions.

II. OPEN ENDED QUESTIONS

Develop / Simulate Following Game Applications:

1. Defective Chessboard
2. Knapsack
3. Spanning Trees
4. Sum of Subset
5. Travelling Sales Person etc.

NOTE:
1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE. BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.
2. IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 10 QUESTIONS

Course Outcomes:
After the completion of course the student will be able to :

CO1: Design algorithms using different design techniques.
CO2: Implement the algorithms using C/C++.
CO3: Analyze the time complexity of algorithms.
CO4: Design key algorithmic paradigms to solve optimization problems.

COs	Mapping with POs
CO1	PO2,PO3,PO4,PO9,
CO2	PO2,PO3,PO4,PO9
CO3	PO2,PO3,PO4,PO9
CO4	PO2,PO3,PO4,PO9

Detailed Scheme

ACADEMIC YEAR   2018-2019

V - VI   (2016-2020 BATCH)

**Dr. Ambedkar Institute of Technology
Bangalore**

**Department of
Information Science and Engineering**

Vision

- To create **D**ynamic, **R**esourceful, **A**dept and **I**nnovative **T**echnical professionals to meet global challenges.

Mission

- To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
- To generate new knowledge by engaging faculty and students in research, development and innovation
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
- To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

- Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

- Prepare highly capable Information Science engineers through best practices.
- Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.
- Educate students to take up social and professional responsibilities with ethical values for the betterment of the society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1: Graduates will have the ability to become successful computing professionals in the area of Information Technology.

PEO2: Graduates will be equipped to enhance their knowledge through core engineering subjects to promote lifelong learning.

PEO3: Graduates will be able to take up social, technical and entrepreneurial challenges.

PROGRAMME OUTCOMES (POs)

1. Ability to apply the knowledge of computing, mathematics, basic sciences and engineering fundamentals for the solution of engineering related problems.

2. Identify, specify and formulate comprehensive solution to complex engineering problems.

3. Design and develop computing systems to meet the specified needs of engineering problems by considering societal and environmental implications.

4. Ability to conduct experiments, analyze and interpret data to provide valid conclusions for problems in Information Science and Engineering

5. Ability to identify and solve computational problems using modern technologies and tools.

6. An understanding to assess societal, health, safety, legal issues relevant to professional engineering practices.

7. Understanding the impact of IT solutions in society and environment for sustainable development.

8. Apply and commit to professional ethics in engineering practices.

9. An ability to work as an individual, as a member and /or leader in diverse teams.

10. Ability to communicate effectively both in written and oral communication.

11. Ability to understand the importance of finance and project management as an individual and/or through team work.

12. Develop a conducive environment to engage in lifelong learning.

Academic Year 2018-2019 : V Semester

SCHEME OF TEACHING AND EXAMINATION
B.E. INFORMATION SCIENCE AND ENGINEERING

S. No.	Subject Code	Subject	Teaching Dept.	Hrs/week				Examination		
				Lecture	Tutorial	Practical		Marks		
							CIE /Assignment	SEE	Credits	Total
1	IS51	Operating Systems	ISE	04			45/5	50	4	100
2	IS52	Java Programming	ISE	03	2		45/5	50	4	100
3	IS53	Web Technologies	ISE	03		-	45/5	50	3	100
4	IS54	Database Management Systems	ISE	04			45/5	50	4	100
5	IS55	Data communication	ISE	03		-	45/5	50	3	100
6	IS56	UNIX Systems Programming	ISE	04	-		45/5	50	4	100
7	ISL57	Database Applications Lab	ISE			02	50	50	1	100
8	ISL58	Web Technologies Lab	ISE			02	50	50	1	100
9	ISL59	Java Programming Lab	ISE			02	50	50	1	100
		Total		21	2	06	450	450	25	900

HEAD
DEPT. OF INFORMATION SCIENCE & ENGG.

Academic Year 2018-2019 : VI Semester

SCHEME OF TEACHING AND EXAMINATION
B.E. INFORMATION SCIENCE AND ENGINEERING

S. No.	Subject Code	Subject	Teaching Dept.	Lecture	Tutorial	Practical	CIE /Assignment	SEE	Credits	Total
				Hrs/week				Examination Marks		
1	HS03	Management and Entrepreneurship	MBA	04			45/5	50	4	100
2	IS61	Mobile Application Development	ISE	03			45/5	50	3	100
3	IS62	Theory of Computation	ISE	03	2		45/5	50	4	100
4	IS63	Cloud Computing	ISE	03			45/5	50	3	100
5	IS64	Computer Networks	ISE	03			45/5	50	3	100
6	IS65x	Elective I (Group-A)	ISE	04			45/5	50	4	100
7	ISL66	Networks Lab	ISE	-		2	50	50	1	100
8	ISL67	Cloud Computing Lab	ISE			2	45/5	50	1	100
9	ISP68	Mini Project	ISE			2	50	50	02	100
		Total		20	2	06	450	450	25	900

Elective I – Group A

IS651	Artificial Intelligence
IS652	Compiler Design
IS653	Python programming
IS654	Machine Learning
IS655	Information Systems
IS656	Cryptography and Network Security

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V SEMESTER

Sub Title : **OPERATING SYSTEMS**		
Sub Code: IS51	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No. of lecture hours/week :4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. To analyze structure ,management, concepts of process scheduling and multithreading in operating system
2. To identify the various methods of causing deadlocks.
3. To describe the techniques for main memory management.
4. To analyze the file system interface, implementation and disk management.
5. To understand the Protection and security concepts in operating system.

Unit No.	Syllabus Content	No of Hours
1	**Introduction**: What operating systems do, Computer-System Architecture, Operating System Structure, Operating System Operations, Process Management, Memory Management, Storage Management, Protection and Security; System Structures: Operating System Services, User Operating System Interface, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual Machines; Process Concept: Process Scheduling, Operations on Processes, Inter process Communication; Multithreaded Programming: Multithreading Models;	10
2	**Synchronization**: The Critical Section Problem, Peterson‟s Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Monitors, Synchronization Examples; Scheduling Criteria , Scheduling Algorithms , Thread Scheduling, Multiple-Processor Scheduling , Real-Time CPU Scheduling ,Operating-System Examples. Dead locks: System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance and detection, Recovery from Deadlock	10
3	**Memory Management Strategies**: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation; Virtual Memory Management: Background, Demand Paging, Copy on Write, Page Replacement, Allocation of frames, Allocating Kernel Memory.	10
4	**File System**: File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection; Implementing File Systems: File System Structure , File System Implementation, Directory Implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery. **Mass storage structures, protection:** Mass storage structures; Disk structure; Disk attachment, Disk scheduling; Disk management; Swap space management.	11
5	**Protection and Security**: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems. The Security Problem, Program Threats ,System and Network Threats, Cryptography as a Security Tool , User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications	11

Note1 : Unit 4 & Unit 5 will have internal choice.
Note 2: Three assignments are evaluated for 5 marks:
   Assignment – I from units 1 and 2.
   Assignment - II from units 3, 4
   Assignment - III from unit 5

TEXT BOOK:

Abraham Silberschatz Peter Baer Galvin, Greg Gagne **- Operating System concepts, ,** 9th edition,
Wiley-India, 2012.

REFERENCE BOOKS:
1. D.M Dhamdhere – **Operating Systems: A Concept Based Approach**, 2nd Edition, Tata
   McGraw- Hill, 2002.
2. P.C.P. Bhatt **- Operating Systems**, 2nd Edition, PHI, 2006.
3. Harvey M Deital **- Operating Systems** –, 3rd Edition Wesley, 1990.

Course Outcomes:

After the completion of the course students will be able to

CO1: Analyze the fundamental principles and concepts of operating systems.
CO2: Identify, analyze various synchronization technique, deadlocks.
CO3: Identify, analyze, apply the various algorithms for memory management.
CO4: Analyze issues related to file system, disk management, protection and security.

COs	Mapping with POs
CO1	PO1,PO2
CO2	PO1,PO2,PO3
CO3	PO1,PO3,PO4
CO4	PO1,PO4

Sub Title : JAVA PROGRAMMING		
Sub Code:IS52	No. of Credits:4=3 : 1 : 0 (L-T-P)	No. of lecture hours/week : 5
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. Identify the different object oriented concepts and implement basic programs.
2. Present inheritance and interface concepts.
3. Introduce multithreading programming concepts and handling errors efficiently.
4. Present different ways of implementing event handling and creating user interfaces using javaFX.
5. Introduce to Java Database Access, Servlets, JSP,RMI Concepts.

UNIT No.	Syllabus Content	No. of Hours
1	**Introduction To Java**: How java changed the internet; Java Buzz words, Byte Code; Object oriented programming; First Simple Java program, Introducing Classes :Classes Fundamentals; Declaring Objects, Assigning Object Reference Variable; Introducing Methods; Inheritance Basics- using Super; Creating Multilevel Hierarchy**,** When constructors are called, method Overriding, Dynamic Method Dispatch, Abstract classes, final with inheritance	10
2	**Packages and Interfaces:** Packages and Interface: Packages, Access Protection, Importing Packages, Interfaces **MultiThreaded Programming** ; The java tread model,The main thread, Creating thread, creating multiple threads, Using isAlive() and join()Thread priorities; Synchronization; Suspending , resuming and stopping threads ;	10
3	**Applets ,Event Handling** The Applet Class: Two types of Applets; Appletbasics; Applet Architecture; An Applet skeleton; Simple Applet displaymethods; Requesting repainting; Using the Status Window; The HTMLAPPLET tag; Passing parameters to Applets; getDocumentbase() andgetCodebase(); ApletContext and showDocument() ; The AudioClipInterface ; The AppletStub Interface; Output to the Console.producer-consumer problems. **Event Handling**: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes;	10
4	**Database Access**, **Servlets :** Overview of J2EE and J2SE.The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process;Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data type ,Exceptions s; Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet ; The Servlet API; The Javax. Servlet Package; Reading Servlet Parameter; The Javax.servlet.http package;Handling HTTP Requests and Responses; Using Cookies; Session Tracking;	12

| 5 | **JSP and RMI , JavaFX, Networking:** Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects. Java Remote Method Invocation.
JavaFX Basics ,JavaFX Layouts and Shapes ,JavaFX Event Driven ,JavaFX Animation and Listeners ,JavaFX UI Controls ,JavaFX Review,Multimedia & Making a Games
Networking:Networking basics, Networking classes and Interfaces, InetAddress, Inet4 Address and Inet6 Address, TCP/IP ClientSockets, URL, URLconnection HttpURL Connection,URIclass,Datagrams | 10 |

Note 1: Unit 1 & Unit 4 will have internal choice.
Note 2:Three assignments are evaluated for 5 marks:
     Assignment – I from units 1 and 2.
     Assignment - II from units 3 and 4
     Assignment – III from unit 5

Course Outcomes
After completing the course the students are able to:

CO1: Apply object oriented programming, exception handling and multithreading concepts in problem solving.
CO2: Design and implement Applets, Parameterized Applets incorporating multithreading and event handling mechanisms.
CO3: Use javaFX aspects in graphical interactive application development and JDBC for database transactions, Handling HTTP requests and responses.
CO4: Develop applications using RMI and JSP
CO5: Design client server applications for connection oriented and connection less services.

COs	Mapping with POs
CO1	PO2,PO5,PO6,PO10
CO2	PO2,PO4,PO5,PO10
CO3	PO2,PO6,PO10
CO4	PO2,PO4,PO6,PO10
CO5	PO2,PO4,PO5,PO10

TEXT BOOK:
     Herbert Schildt: Java - The Complete Reference, 9th Edition, Tata McGraw Hill, 2014.
     (Chapters 1, 2, 3, 4, 5, 6, 8, 9,10, 11,12,14,15,20, 21, 22, 29, 30).

REFERENCE BOOKS / WEBLINKS:
1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Ed, Pearson Education, 2013.
2. Java ProgrammingbyHariMohan Pandey,PearsonEducation,2012.
3. Java 6Programming,BlackBook,KoGenT,dreamtechPress, 2012.
4. www.tutorialspoint.com/java/
5. www.javatpoint.com/java-tutorial
6. https://www.youtube.com/watch?v=rXhdP4sKSME&list=PLrodECPviD6dUfQsc5c72 Yi_7 TlkR0uuF

Sub Title : WEB TECHNOLOGIES		
Sub Code: IS53	No. of Credits:3=3 : 0 : 0 (L-T-P)	No. of lecture hours/week : 3
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 39

Course Objectives:
1. To create a web page using XHTML using Cascading Style Sheets
2. To do data validation and user interaction using JavaScript
3. To create XML documents and provide styling to documents.
4. To develop web applications using CGI/Perl.
5. To design web applications using the concepts of PHP.

UNIT No	Syllabus Content	No of Hours
1	XHTML : Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup. Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML. **CSS:** Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images	9
2	**Javascript:** Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions ,Introduction JQuery	8
3	**Javascript and HTML documents:** The Javascript execution environment; The Document Object Model; Element access in Javascript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model	7
4	**XML:** Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying XML documents with CSS; XSLT style sheets; XML processors; Web services.	7
5	**Perl:** Origins and uses of Perl; Scalars and their operations; Assignment statements and simple input and output, Fundamentals of arrays; Hashes; References; Functions; Pattern matching. **CGI Programming** The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module. **PHP:** Origins and uses of PHP, Overview of PHP, General syntactic characteristics,Arrays, Form handling, Files, Cookies, Session Tracking.	8

Note 1: Unit 1& Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4 .
Assignment -III from Unit 5

Course Outcomes:

Students will demonstrate the knowledge and the skills acquired with respect to:

CO1: Design simple web pages using different tags of XHTML and Classify and use different levels of style sheets
CO2 : Validate and provide user functionality using JavaScript
 CO3 : Design and develop XML document and use the style sheet to display.
CO4: Develop web pages using PERL and CGI programs.
CO5: Design and develop PHP programs to perform database access, session tracking

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO6,PO7,PO9
CO2	PO2,PO3,PO5,PO6,PO9
CO3	PO1
CO4	PO1, PO5
CO5	PO1, PO4, PO5

TEXT BOOKS:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson education, 2011.
2. Learning jQuery , Better interaction, design, and web development with simple javaScript techniques , Fourth Edition , Jonathan Chaffer, Karl Swedberg 2013.

REFERENCE BOOKS / WEBLINKS:
1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 4th Edition, Pearson education, 2011.
2. Pro PHP and jQuery- JASON LENGSTORF,2010.
3. http://nptel.ac.in
4. http://www.w3schools.com/

Sub Title : DATABASE MANAGEMENT SYSTEMS		
Sub Code:IS54	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 4
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours :52

Course Objectives:
1. To analyze the basic concepts and architecture of DBMS.
2. To understand the conceptual and relational models to design databases.
3. To Create and manipulate a relational database using SQL.
4. To understand the normalization steps in database design and removal of data anomalies.
5. To acquire the knowledge of transaction processing, NoSQL and MongoDB concepts

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** Introduction; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A when not to use a DBMS. Data models, schemas and instances;Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Classification of Database Management systems. **Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.TEXT 1	12
2	**Relational Model and Relational Algebra**: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra. Relational Database Design Using ER-to-Relational Mapping TEXT1	10
3	**SQL :Schema Definition, Basic Constraints and Queries:** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Embedded SQL. Introduction to SQL Programming Techniques: Database programming issues and techniques, Embedded SQL, Dynamic SQL. TEXT1	10
4	**DatabaseDesign: Functional Dependencies and Normalization:** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form. Relational Database Schema Design Algorithms and further Dependencies: Properties of Relational Decompositions; Multi valued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form TEXT1	10

5	**Transaction Management:** Overview of Transaction Management**:** The ACID Properties, Transaction and schedules, Concurrent Execution of Transactions, Lock based concurrency control, performance of locking TEXT2 **Introduction to NoSQL and MongoDB:** What is NoSQL? Why NoSQL? Benefit over RDBMS, Types of NoSQL Database, and NoSQL vs. SQL Comparison. What is MongoDB? Overview of MongoDB, Design Goals for MongoDB Server and Database, MongoDB Tools, MongoDB CRUD Concepts, MongoDB Datatypes	10

Note 1: Unit 1 & Unit 5   will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
    Assignment – I from Units 1 and 2.
    Assignment – II from Units 3 and 4 .
    Assignment -III from Unit 5

Course Outcomes:
After completing the course the students are able to:

CO1: Analyze the database concepts and data models for real world applications.
CO2: Design a database schema for database application
CO3 : Design and apply the queries to the database to meet the user requirements.
CO4: Apply normalization techniques to database .
CO5: Analyze the concepts of transaction processing, NoSQL and MongoDB

COs	Mapping with POs
CO1	PO2,PO4,PO5,PO12
CO2	PO2,PO4,PO5,PO6
CO3	PO2,PO3, PO5, PO9,PO12
CO4	PO2,PO3,PO5
CO5	PO4, PO6, PO9,PO12

TEXT BOOKS:
1. Elmasri and Navathe: Fundamentals of Database Systems, 6th Edition, Pearson Education, 2011.
2. Raghu Ramakrishna and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

REFERENCE BOOKS/WEBLINKS:
1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education, 2006.
3. www.w3resources.com

Sub Title : DATA COMMUNICATION		
Sub Code:IS55	No. of Credits:3=3: 0 : 0 (L-T-P)	No. of lecture hours/week :3
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 39

Course Objectives:
1. To become familiar with the concepts of data communication, and network models .
2. To understand different techniques of analog and digital data transmission.
3. To study the error detection and correction techniques .
4. To understand different protocols of data link control and MAC protocols.
5. To analyze different connecting devices, Ethernet and wireless technologies.

UNIT No.	Syllabus Content	No of Hours
1	**Communication Networks and Layered Architecture:** Data Communications; Networks; the Internet; Protocols and Standards; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite. **Data Signals and Digital Transmission:** Analog and digital signals; Transmission impairment; Data rate limits; Performance;	8
2	**Digital Transmission:** Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes. **Analog Transmission and Multiplexing:** Digital - to - Analog conversion; Analog - to - Analog conversion; Multiplexing; Spread spectrum.	7
3	**Transmission Media** : Twisted pair cable, Coaxial cable, Fibre-Optic cable, Radio waves, Microwaves, Infrared. Introduction to error detection / correction; Block coding; Linear block codes; Cyclic codes, Checksum.	8
4	**Data Link Control Protocols :** Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol - framing, transition phases. **Medium Access Control Protocols:** Random Access; Controlled Access; Channelization.	8
5	**Ethernet:** IEEE standards; Standard Ethernet and changes in the standard Ethernet,fast and gigabit Ethernet. **Wireless LANS And Connection of LANS: Mac sub layer Protocols,** IEEE 802.11frame structure**,** Connecting devices;	8

Note 1: Unit 1 & Unit 4 will have internal choice.
Note 2: Three assignments are evaluated for 5 marks:
      Assignment – I from units 1 and 2.
      Assignment - II from units 3, 4.
      Assignment – III from unit 5

Course Outcomes:

After completion of course Students will be able to

CO1: Analyze different network communication models .
CO2: Differentiate the techniques of transmission and multiplexing of analog/ digital signals .
CO3: Apply error detection /correction methods to verify the integrity of data during transmission .
CO4: Analyze various Data Link Control and MAC protocols .
CO5: Understand Ethernet & wireless LAN technologies and connecting devices.

COs	Mapping with POs
CO1	PO1,PO2, PO5, PO7,PO12
CO2	PO1,PO2, PO12
CO3	PO1,PO2,PO4,PO6,PO9,PO12
CO4	PO1,PO2,PO12
CO5	PO1,PO2,PO3,PO7,PO12

TEXT BOOK:

Behrouz A. Forouzan: Data Communications and Networking, 5th Edition, Tata McGraw-Hill,2013.

REFERENCE BOOKS / WEBLINKS:

1. William Stallings ,Data and Computer Communication, , 8th Edition, Pearson Education, 2007.
2. Larry L. Peterson and Bruce S. David ,Computer Networks: A Systems Approach -, 4th Edition, Elsevier, 2007.
3. Wayne Tomasi ,Introduction to Data Communications and Networking –, Pearson Education, 2005.
4. Nader F. Mir ,Computer and Communication Networks –, Pearson Education, 2007.
5. Alberto Leon, Garcia, Indra Widjaja: Communication Networks: Fundamental Concepts and Key Architectures, 3rd Edition, Tata McGraw- Hill, 2011.
6. http://www.digi.com/resources/standards-and-technologies/rfmodems/ zigbee-wireless-standard
7. http://www.rfwireless-world.com/Tutorials/Zigbee_tutorial.html

Sub Title : UNIX SYSTEMS PROGRAMMING		
Sub Code:IS56	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 4
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 52

Course Objectives:
1. Know the operating system standards like POSIX standards.
2. Comprehend UNIX internal-kernel structures.
3. Design & develop UNIX commands & applications using UNIX system API's.
4. Understand the UNIX process control mechanism.
5. Analyze the problem & apply the relevant IPC techniques in UNIX system programming.
6 Adopting signals as IPC for efficient low level and high level application development on Unixsystems.

UNIT No.	Syllabus Content	No of Hours
1	**Introduction:** UNIX and ANSI Standards:The ANSI C Standard, The ANSI/ISOC++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX. FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.	10
2	**UNIX Files:** File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. **UNIX File APIs:** General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.	12
3	**UNIX Processes:** The Environment of a UNIX Process:Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.	10
4	**Process Control:** Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.	10
5	**Signals and Daemon Processes:** Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers.Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model. **Interprocess Communication – 1:** Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.	10

Note 1: Unit 2 & Unit 5   will have internal choice.
Note 2: Three assignments are evaluated for 5 marks:
      Assignment – I from units 1 and 2.
      Assignment - II from units 3, 4.
      Assignment – III from unit 5

Course Outcomes:

After completion of course students will be able to

CO1 : Understand the fundamentals of UNIX operating system such as the POSIX standards, UNIX processes, UNIX filesystem and Signals.

CO2 : Analyze UNIX kernel level support for UNIX processes, UNIX filesystem and Signals.

CO3 : Demonstrate advanced UNIX features such as signals, Job Control, daemon processes and inter process communication.

CO4 : Develop UNIX commands, utilities and applications utilizing UNIX System calls.

CO5 : Analyze process control, Deamon characteristics, coding rules and error logging and IPC facilities

COs	Mapping with POs
CO1	PO1,PO3,PO5
CO2	PO2,PO3,PO5
CO3	PO2,PO3,PO5
CO4	PO2,PO3,PO4,PO5
CO5	PO2,PO3,PO4,PO5

TEXT BOOKS:

1. Terrence Chan: UNIX System Programming Using C++, Pearson India, 2015.
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 3rd Edition, Pearson Education, 2015.

REFERENCE BOOKS / WEBLINKS:

1. Maurice JBach :Advanced UNIX Programming, 2nd Edition, Pearson Education, 2015.
2. UNIX kernel Internals –UreshVahlia PHI 2010.
3. www.tutorialspoint.com/unix/unix-basic-operators.html
4. https://www.youtube.com/watch?v=DpcCtaaGxyQ&list=PLd3UqWTnYXOmKXhD -PVqMN1XhNQV-s4lj

Sub Title : DATABASE APPLICATIONS LAB		
Sub Code:ISL57	No. of Credits:1=0: 0 : 1 (L-T-P)	No. of lecture hours/week : 2
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 =100	

Course Objectives:

1. To execute SQL commands.
2. To implement simple exercises on relational database schema.
3. To design a relational database schema for specific database application using SQL.
4. To apply the normalization procedure on relational database schema

I. LIST OF PROGRAMS

1 Consider the Insurance database given below. The primary keys are underlined and the data types are specified:
PERSON (driver – id #: String, name: string, address: string)
CAR (regno: string, model: string, year: int)
ACCIDENT (report-number: int, accd-date: date, location: string)
OWNS (driver-id #:string, Regno:string)
PARTICIPATED (driver-id: string, Regno:string, report-number:int, damage amount:int)
(i) Create the above tables by properly specifying the primary keys and the foreign keys.
(ii) Enter at least five tuples for each relation.
(iii) Demonstrate how you
    a. Update the damage amount to 25000 for the car with a specific Regno in the
      ACCIDENT table with report number 12.
    b. Add a new accident to the database.
(iv) Find the total number of people who owned cars that were involved in accidents in 2014.
(v) Find the number of accidents in which cars belonging to a specific model were involved.

2 Consider the following relations for an order processing database application in a company:
CUSTOMER (cust #: int , cname: string, city: string)
ORDER (order #: int, odate: date, cust #: int, ord-Amt: int)
ORDER – ITEM (order #: int, item #: int, qty: int)
ITEM (item # : int, unit price: int)
SHIPMENT (order #: int, warehouse#: int, ship-date: date)
WAREHOUSE (warehouse #: int, city: string)

(i) Create the above tables by properly specifying the primary keys and the foreign keys.
(ii) Enter at least five tuples for each relation.
(iii) Produce a listing: CUSTNAME, #oforders, AVG_ORDER_AMT, where the middle column is the total numbers of orders by the customer and the last column is the average order amount for that customer.
(iv) List the order# for orders that were shipped from *all* the warehouses that the company has in a specific city.
(v) Demonstrate the deletion of an item from the ITEM table and demonstrate a method of handling the rows in the ORDER_ITEM table that contain this particular item.

3 Consider the following database of student enrollment in courses & books adopted for each course:

STUDENT (<u>regno</u>: string, name: string, major: string, bdate:date)
COURSE (<u>course #</u>:int, cname:string, dept:string)
ENROLL (<u>regno</u>:string, <u>course#</u>:int, <u>sem</u>:int, marks:int)
BOOK _ ADOPTION (<u>course#</u> :int, <u>sem</u>:int, book-ISBN:int)
TEXT (<u>book-ISBN</u>:int, book-title:string, publisher:string, author:string)

(i)   Create the above tables by properly specifying the primary keys and the foreign keys.
(ii) Enter at least five tuples for each relation.
(iii) Demonstrate how you add a new text book to the database and make this book be adopted by some department.
(iv) Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
(v)   List any department that has *all* its adopted books published by a specific publisher.

4 The following tables are maintained by a book dealer:

AUTHOR (<u>author-id</u>:int, name:string, city:string, country:string)
PUBLISHER (<u>publisher-id</u>:int, name:string, city:string, country:string)
CATALOG (<u>book-id</u>:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
CATEGORY (<u>category-id</u>:int, description:string)
ORDER-DETAILS (<u>order-no</u>:int, <u>book-id</u>:int, quantity:int)

(i)   Create the above tables by properly specifying the primary keys and the foreign keys.
(ii) Enter at least five tuples for each relation.
(iii) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
(iv) Find the author of the book which has maximum sales.
(v)   Demonstrate how you increase the price of books published by a specific publisher by 10%.

5 Consider the following database for a banking enterprise:

BRANCH(<u>branch-name</u>:string, branch-city:string, assets:real)
ACCOUNT(<u>accno</u>:int, branch-name:string, balance:real)
DEPOSITOR(<u>customer-name</u>:string, <u>accno</u>:int)
CUSTOMER(<u>customer-name</u>:string, customer-street:string, customer-city:string)
LOAN(<u>loan-number</u>:int, branch-name:string, amount:real)
BORROWER(<u>customer-name</u>:string, <u>loan-number</u>:int)

(i)   Create the above tables by properly specifying the primary keys and the foreign keys
(ii) Enter at least five tuples for each relation
(iii) Find all the customers who have at least two accounts at the   Main branch.
(iv) Find all the customers who have an account at all the branches located in a specific city.
(v)   Demonstrate how you delete tuples in ACCOUNT relation at every branch located in a specific city.

II.OPEN ENDED QUESTIONS

1. Develop the Database applications for any of the following:
    1. customer-sales
    2. Student Library
    3. Employee-payroll
    4. Video Library
    5. Any Application
2. NO SQL Examples

NOTE :
1. **THE EXERCISES ARE TO BE SOLVED IN AN RDBMS ENVIRONMENT LIKE ORACLE OR DB2.**
2. **STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.**
3.**IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 5 QUESTIONS AND STUDENT NEED TO DO EXTRA QUERIES ALSO.**

Course Outcomes:
After completing the course the students are able to:

CO1: Apply the underlying concepts of database technologies.
CO2:Design and implement a relational database schema for a given problem-domain using SQL.
CO3: Develop sophisticated queries to extract information from large datasets.

COs	Mapping with POs
CO1	PO1,PO2,PO3
CO2	PO4,PO5,PO9
CO3	PO4,PO5,PO9, PO12

Sub Title : WEB TECHNOLOGIES LAB		
Sub Code: ISL58	No. of Credits:1=0: 0 : 1 (L:T:P)	No. of lecture hours/week : 2
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 =100	

Course Objectives:

    1. Create a web page with text, images, links, lists, tables, and frames
    2. To use Cascading style sheet in designing web pages
    3. To use Javascript
    4. To create XML schema and XSLT style sheet.
    5. To create and execute PHP to access database, cookies and do session tracking.
    6. Use PERL for CGI programming and access MySQL databases.

I. LIST OF PROGRAMS

1. I) Create a simple file to demonstrate the use of different tags
   a) Moving text= "Simple HTML Tags"

   b) Different heading tags(h1 to h6)

   c) Paragraph

   d) Horizontal line

   e) Line break

   f) Block quote

   g) Pre tag

   h) Different logical styles(<b>,<i>,<sub>,<sup>)
2. Write code to create an html file to link different html pages which contains images,tables,lists and also link within a page

   3. Design a web page using the different styles using inline, external & internal style sheets.

 4. Develop and demonstrate a XHTML file that includes Javascript script for the following
    problems:
     a) Input: A number n obtained using prompt
      Output: The first n Fibonacci numbers
     b) Input: A number n obtained using prompt
      Output: A table of numbers from 1 to n and their squares using alert

5. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail address. Make up sample data for three students. Create a CSS style sheet and use it to display the document.

6. a) Write a Perl script to demonstrate the string concatenation and repetition.
   b)Write a Perl program to display various Server Information like Server Name, Server
      Software, Server protocol, CGI Revision etc.

7. a) Write a perl script to demonstrate built-in array functions (PUSH, POP, SHIFT,
       UNSHIFT).
      b)Write a Perl program to accept UNIX command from a HTML form and to display the
      output of the command executed.

8. a) Write a Perl program to display a digital clock which displays the current time of the server.

   b) Write a program to demonstrate hide and show effects of html elements using jquery.

9. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

10 a)Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.

   b)Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.

II. OPEN ENDED QUESTIONS

Develop web based applications for any of the following
1. Simple employee portal.
2. Shopping cart.
3. Quiz application.
4. Reservation system.
5. Search engine.
6. Any Application

NOTE :
1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.
2IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 10 QUESTIONS.

Course Outcomes:
Students will demonstrate the knowledge and the skills acquired with respect to:

CO1: Design simple web pages using different tags of XHTML and Classify and use different levels of style sheets
CO2 : Validate and provide user functionality using JavaScript
 CO3 : Design and develop XML document and use the style sheet to display.
CO4: Develop web pages using PERL and CGI programs.
CO5: Design and develop PHP programs to perform database access, session tracking

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COs	Mapping with POs
CO1	PO1,PO2,PO3,PO6,PO7,PO9
CO2	PO2,PO3,PO5,PO6,PO9
CO3	PO1, PO4
CO4	PO1, PO4
CO5	PO1, PO4

Sub Title : JAVA PROGRAMMING LAB		
Sub Code:ISL59	No. of Credits: 0 : 0 :1	No. of lecture hours/week : 2
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 =100	

Course Objectives:

1. Design & Develop the fundamentals of Object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
2. Design & Develop exception handling and multithreading concepts.
3. Develop efficient Java applets and applications using OOP concepts.
4. Design & Develop basic understanding of network application programs.

I. LIST OF PROGRAMS

1. a. Design a JAVA Program to demonstrate Constructor Overloading and method overloading.
   b. Develop a JAVA Program to implement Inner class and demonstrate its Access Protections.

2. a. Develop a JAVA Program to demonstrate Inheritance.
   b. Write a JAVA Program to demonstrate Exception Handling (Using Nested try catch and finally).

3. Develop a JAVA program which has
   i. A Class called Account that creates account with 500Rs minimum balance, a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws LessBalanceException if an account holder tries to withdraw money which makes the balance become less than 500Rs.
   ii. A Class called LessBalanceException which returns the statement that says withdraw amount (___Rs) is not valid.
   iii. A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a LessBalanceException take appropriate action for the same.

4. Design a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.

5. Develop a JAVA program which has
   i. A Interface class for Stack Operations
   ii. A Class that implements the Stack Interface and creates a fixed length Stack.
   iii. A Class that implements the Stack Interface and creates a Dynamic length Stack.
   iv A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.

6. Develop JAVA programs which demonstrates utilities of LinkedList Class

7. Write a JAVA Program which uses FileInputStream / FileOutPutStream Classes.

8. Develop a JAVA program which uses Datagram Socket for Client Server Communication.

9. Design JAVA Applet programs which handles MouseEvent

10.Develop JAVA Applet programs which handles KeyBoardEvent

II. OPEN ENDED QUESTIONS

Develop applications for data base access, servlet request/response, rmi, jsp,userinterface
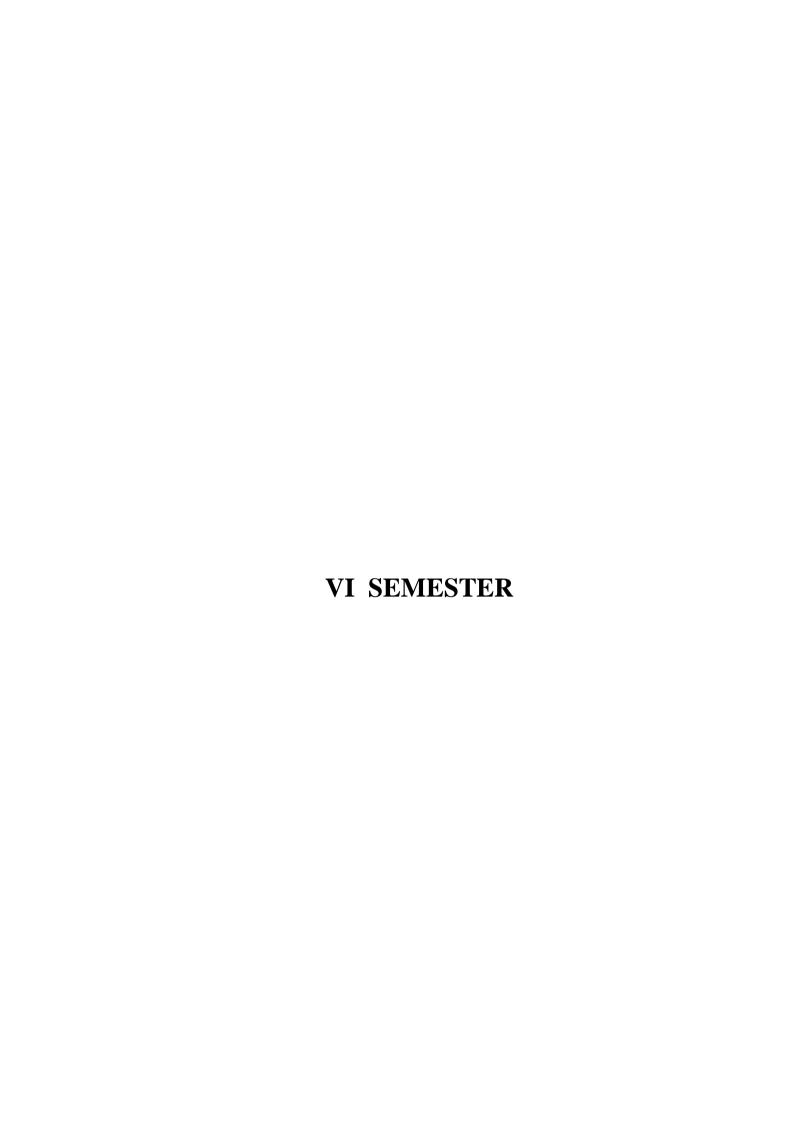for any application using javaFX, any gaming application etc

NOTE :
**1. STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED
QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN
CHARGE.**
**2. IN THE EXAMINATION EACH STUDENT PICKS ONE QUESTION FROM A LOT OF ALL 10
QUESTIONS.**

Course Outcomes:
After completing the course the students are able to:

CO1. Recognize the basic object oriented concepts & apply them to create java applications.
CO2. Demonstrate java application with inheritance and interface concepts.
CO3. Design java applications with multithreading concepts and demonstrate the
      error handling concepts.
CO4. Create GUI applications with the help of javaFX and handle events.
CO5. Design client server applications and security models.

COs	Mapping with POs
CO1	PO2,PO5,PO6,PO10
CO2	PO2,PO4,PO5,PO10
CO3	PO2,PO6,PO10
CO4	PO2,PO4,PO6,PO10
CO5	PO2,PO4,PO5,PO10

VI SEMESTER

Sub Title: MANAGEMENT AND ENTREPRENEURSHIP		
Sub Code: HS03	No. of Credits : 4:0:0(L:T:P)	No. of Lecture hours/week : 4
Exam Duration : 3 Hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours: 52

Course Objectives :
1. To help students understand the Management concepts & its evolution.
2. To impart the knowledge about various Managerial functions.
3. To make the student learn the Entrepreneurial process.
4. To gain an insight of funding agencies & understand the role of SSI in economic development.
5. To have a clear understanding of various business opportunities & designing the Business plan.

UNIT No.	Syllabus Content	No. of Hours
1	**MANAGEMENT:** Introduction-meaning-nature, characteristics of management, scope, functions of management and functional areas of management, management as a science or an art or profession, management and administration, roles of management, levels of management, Development of management thought -Early management approaches, Modern management approaches.	08
2	**PLANNING, ORGANIZING, DIRECTING AND CONTROLLING:** **PLANNING:** Meaning and Nature, Types of Plans and Steps in Planning process. **ORGANIZING:** as a Managerial function – Nature and purpose of organization, principles of organization, types of organization. Departmentation, Committees, Centralization Vs Decentralization of authority and responsibility span of control, MBO and MBE (only concepts), Staffing: Nature and importance of staffing, process of selection and recruitment, Decision Making: Definition, Types and Decision Making Process. **DIRECTING:** Meaning and nature of directing, leadership styles – Autocratic, Democratic, Charismatic, Laissez faire and Participative. Leadership theories – Trait, Behavioral and Contingency. Introduction to Motivation theories – Maslow, Herzberg, Carrot & Stick & Mc. Gregor's Theory of X & Y. **CO-ORDINATION:** Meaning and importance of Co-ordination, Team Building & Group Dynamics, Communication – meaning and importance, types and barriers of communication. **CONTROLLING:** Meaning and steps in controlling-Essentials of a sound control system-Types of control, Method of establishing control (in brief).	12
3	**ENTREPRENEUR**: Meaning, evolution of the concept, Scope of Entrepreneur, functions of an Entrepreneur, Characteristics of an Entrepreneur, types of entrepreneur, Intrapreneur – an emerging class. Difference between Entrepreneur, Intrapreneur & Manager, Stages in Entrepreneurial process, Problems faced by an Entrepreneur, Role of Entrepreneurs in economic development, Entrepreneurship- Meaning &	10

	Importance of Entrepreneurship in India, barriers, Women entrepreneur – Concept & steps to develop Women Entrepreneur.		
4	**SMALL SCALE INDUSTRY**: Concept of MSME, Ancillary Industry and Tiny Industry, Definition;, Characteristics; Objectives, Scope and role of SSI in economic Development, Advantages of SSI, problems of SSI, Steps to start an SSI, Government Policy towards SSI; Introduction to GATT/ WTO/ LPG. Forms of ownership. **SUPPORTING AGENCIES OF GOVERNMENT FOR SSI:** Meaning, Nature of support; Objectives, functions. **INSTITUTIONAL SUPPORT:** Different Schemes, TECKSOK, KIADB, KSSIDC, DIC,SISI NSIC, SIDBI, KSFC. Sources of financing an enterprise- long term and short term.	12
5	**PREPARATION OF PROJECT:** Meaning, Project identification, Project selection, Project Report - Need of Project, Contents: formulation, Errors of project report, Project Appraisal, Feasibility Study-Market Feasibility Study, Technical Feasibility Study, Financial Feasibility Study, Social Feasibility Study. Business opportunities, Business plan: Definition, components of business plan, reasons for failure of business plan.	10

Note 1 : Unit 2 and Unit 4 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes : **CO1** : The students will gain knowledge on management concepts & its evolution. **CO2** : The students will learn the application of managerial skills & attributes. **CO3** : The students will get an in depth knowledge of entrepreneurial process & will be able to apply the entrepreneurial skills. **CO4** : Students compile information & explore the sources of funding agencies. **CO5** : Students will be able to identify business opportunities & prepare the business plan.

COs	Mapping with POs
CO1	PO12
CO2	PO9,PO10,PO11,PO12
CO3	PO11,PO12
CO4	PO11
CO5	PO7,PO11,PO12

TEXT BOOKS:

    1. Entrepreneurship and Management- S Nagendra and V S Manjunath- Pearson Publication 4 /e, 2009.
    2. Dynamics of Entrepreneurial Development and Management-Vasant Desai-Himalaya Publishing House.
    3. Principles of Management – PC Tripathi, and P N Reddy – Tata MacGraw Hill.

REFERENCE BOOKS:

1. Entrepreneurship Development – Poornima M Charanthimath Pearson Education 2006.
2. Entrepreneurship and management - Shashi k Gupta- Kalyani publishers, Latest edition.
3. Organizational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, Pearson, 14/e, 2012.
4. Financial Management- Shashi k Gupta- Kalyani publishers, Latest edition.

Sub Title : MOBILE APPLICATION DEVELOPMENT		
Sub Code:IS61	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100**	**Total No. of Contact Hours : 39**

Course Objectives:

1. To understand the Mobile - Android OS architecture and life cycle.
2. To analyze and use appropriate tools for Android Application development.
3. To be familiar with managing of application resources.
4. To build elegant user interfaces with views, layouts & form widgets.
5. To understand the usage of Services and Notifications in Android Apps.

UNIT No	Syllabus Content	No of Hours
1	**An Overview of Android:** Introducing Android – History of Mobile Software Development, The Open Handset Alliance, Android Platform differences, Android Platform. Setting Up Your Android Development Environment - Configuring Your Development environment, Exploring Android software development Kit. Writing first android application - Testing Your Development Environment, Building Your First Android Application. **Android Application Design Essentials:** Understanding the Anatomy of an Android Application - Mastering Important Android Terminology, Using the Application Context, Receiving and Broadcasting Intents.	7
2	**Defining the application using Android Manifest File –** Understanding and Configuring the Android Manifest File. **Managing Application Resources:** Resources, Working with Resources **Designing User Interfaces with Layouts:** Creating User Interfaces in Android, Using Built-In Layout Classes.	7
3	**Android User Interface Design Essentials:** Exploring User Interface Screen Elements, Introducing Android Views and Layouts, Displaying Text to Users with TextView, Retrieving Data from Users, Using Buttons, Check Boxes, and Radio Groups, Getting Dates and Times from Users, Using Indicators to Display Data to Users, Adjusting Progress with SeekBar, Providing Users with Options and Context Menus, Working with Dialogs	9
4	**Drawing and Working with Animation** -Working with Animation - Working with Frame-by-Frame Animation, Working with Tweened Animations. **Working with Files and Directories:** Exploring with the Android Application Directories, Working with Other Directories and Files on the Android File System **Storing Structured Data Using SQLite Databases:** Creating a SQLite Database,Creating, Updating, and Deleting Database Records, Querying SQLite Databases, Closing and Deleting a SQLite Database	9

5	**Working with Services:** Determining When to Use Services, Understanding the Service Lifecycle, Creating a Service, Controlling a Service. **Working with Notifications**: Notifying the User, Notifying with the Status Bar, Vibrating the Phone, Blinking the Lights.	7

Note 1: Unit 3 & Unit 4 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
     Assignment – I from Units 1 and 2.
     Assignment – II from Units 3 and 4 .
     Assignment -III from Unit 5

Course Outcomes:
After completing the course the students are able to:

    CO1: Analyze the fundamentals of Mobile application development.
    CO2: Analyze the problems to build Mobile apps by assessing the basic framework and
        usage of SDK.
    CO3: Design and develop Android applications using various resources and built-in classes.
    CO4: Develop the skills in designing and deploying the sophisticated mobile applications.
    CO5: Design and deploy Android applications with compelling User Interfaces.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO5
CO2	PO1,PO2,PO4,PO5,PO6
CO3	PO1,PO3,PO4,PO6,PO7
CO4	PO6,PO7,PO9,PO11,PO12
CO5	PO1,PO3,PO4,PO6,PO7

TEXT BOOK:

Shane Conder, Lauren Darcey: Android Wireless Application Development, Pearson

education, 2010.

REFERENCE BOOKS:

1. Reto Meier: Professional Android 4 Application Development , Wrox Publication,2015
2. ZigurdMednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura: Programming Android, 2nd Edition , O'Reilly Publication, 2012.
3. SatyaKomatineni , Dave MacLean , SayedHashimi : Pro Android 3, Apress publication ,2011.

Sub Title : THEORY OF COMPUTATION		
Sub Code: IS62	**No. of Credits:4=3 : 1 : 0 (L-T-P)**	**No. of lecture hours/week : 5**
Exam Duration : 3 hours	**CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 52**

Course objectives:
1. Introduce concepts in automata theory and to classify machines by their power to recognize languages.
2. To understand and design deterministic and non-deterministic finite automata, Regular languages.
3. To apply ideas and techniques discussed to various software designs. Recognize phases of compiler with respect to design.
4. Design grammar, Pushdown Automata and recognizers for different formal languages.

Unit No.	Syllabus Content	No. of Hours
1	**Introduction to Finite Automata:** Introduction to Finite Automata; The central concepts of Automata theory: Alphabets, Strings, Language; Deterministic finite automata; Nondeterministic finite Automata; Finite automata with Epsilon-transitions.; Applications of finite automata.	11
2	**Regular expressions and Languages, Properties of Regular Languages:** Regular expressions; Finite Automata and Regular Expressions; Pumping Lemma for regular languages; Equivalence and minimization of automata; Applications of Regular Expressions and Regular languages.	10
3	**Context-Free Grammars And Languages:** Context free grammars; Writing a Grammar; Parse trees; Applications of CFGs; Ambiguity in grammars. **Normal forms for CFGs:** Useless symbols, λ-productions, Unit productions, CNF, GNF.	11
4	**Pushdown Automata:** Definition of the Pushdown automata; Acceptance by final state, empty stack; Equivalence of PDA's and CFG's.	10
5	**Introduction To Turing Machine:** The standard Turing machine; Design of Turning machine; Other models of Turing machines; Universal TM, Post correspondence problem (PCP).	10

Note 1: Unit 1 & Unit 3 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
     Assignment – I from Units 1 and 2.
     Assignment – II from Units 3 and 4 .
     Assignment -III from Unit 5

Course Outcomes:
After completion of course students will be able to:

CO1: Analyze concepts in automata theory and classify machines by their power to recognize languages.
CO2: Impart the knowledge of models of computation.
CO3: Design grammar and recognizers for different formal languages.
CO4: Design and solve problems related to Pushdown Automata & Turing Machine.
CO5: Illustrate theoretical aspects of formal languages in Compiler Design.

COs	Mapping with POs
CO1	PO1,PO3, PO5, PO10, PO12
CO2	PO2,PO3,PO4,PO5, PO12
CO3	PO3,PO4,PO5, PO9, PO10
CO4	PO3,PO4,PO5, PO9, PO12
CO5	PO2,PO3, PO12

TEXT BOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2009.

2. Peter Linz: An Introduction to Formal Languages and Automata, 5th Edition, Jones and Bartlett, New Delhi, India, 2011.

REFERENCE BOOKS/WEB LINKS:

1. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.

2. Michael Sipser, "Introduction to Theory of Computation", 3rd Edition, Cengage Learning, 2012.

3. http://mapmf.pmfst.unist.hr/~milica/Matem_teorija_r/MTR_web/Introduction%20To%20Automata%20Theory.pdf

Sub Title : CLOUD COMPUTING		
SubCode:IS63	No. of Credits:3=3 : 0 : 0 (L-T-P)	No. of lecture hours/week : 3
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 39

Course Objectives:

1. To study the history and the fundamental concepts of Cloud Computing, Parallel, Distributed Computing and Virtualization.
2. To understand the concept of cloud computing architecture and different Cloud models.
3. To impart Cloud offerings which enhances the usage of Cloud.
4. To analyze the Cloud Storage and Security maintenances.
5. To become familiar with the different applications of Cloud Computing.

UNIT No	Syllabus Content	No of Hours
1	**Introduction to Cloud Computing:** Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments Computing Platforms and Technologies	7
2	**Principles of Parallel and Distributed Computing:** Eras of Computing , Parallel vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing **Virtualization:** Introduction, Characteristics of Virtualized Environments, Virtualization and Cloud Computing, Pros & Cons of Virtualization	7
3	**Cloud Computing Architecture:** Introduction, Cloud Reference Model, types of Clouds, Economics of the cloud, Open challenges	7
4	**Cloud offerings:** Cloud Analytics, Testing under cloud, Information Security, Virtual Desktop Infrastructure, Storage Cloud. **Cloud management:** Introduction, Resiliency, Provisioning, Asset management. Cloud governance, High availability and disaster recovery, Charging models, Usage reporting, Billing and metering.	9
5	**Cloud Platforms in Industry:** Amazon Web Services, Google AppEngine **Cloud Applications:** Scientific Applications, Business and Consumer Applications	9

Note 1: Unit 4 & Unit 5 will have internal choice.
Note 2: Three assignments are evaluated for 5 marks
   Assignment – I from Units 1 and 2.
    Assignment – II from Units 3 and 4 .
    Assignment -III from Unit 5

Course Outcomes:
After the completion of course, the student will be able to:

CO1: Analyze core concepts and fundamentals of the Cloud Computing.
CO2: Analyze systems, protocols and mechanisms to support Cloud Infrastructure.
CO3: Identify the hardware necessary for Cloud Computing.
CO4: Develop applications and host on Cloud Computing.
CO5: To manage the Cloud Environment.

COs	Mapping with POs
CO1	PO1,PO7,PO11,PO12
CO2	PO1,PO4,PO7,PO11,PO12
CO3	PO1,PO2,PO3, PO5,PO8
CO4	PO1,PO8, PO10,PO11,PO12
CO5	PO4,PO5,PO6,PO7,PO8

TEXT BOOKS:
1. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi ,Mastering Cloud Computing , Tata McGraw Hill Education Private Limited, 2013.
2. Dr. Kumar Saurabh , Cloud Computing , Wiley India, 2011.

REFERENCE BOOKS:

1. Dinkar Sitaram, Geetha Manjunath ,Moving to the Cloud. Elsevier Publications, 2011.
2. Barrie Sosinsky, Cloud Computing Bible , Wiley Publishing, Inc, 2011.

Sub Title : COMPUTER NETWORKS		
Sub Code:IS64	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100**	**Total No. of Contact Hours :39**

Course objectives:
1. Identifying functions of the network layer,routing in packet networks and traffic management.
2. Tabulate the working of various routing protocols with usage of TCP/UDP..
3. To acquire the knowledge of the working of various application layer services like DNS, Remote login, E-mail, FTP,MIME.
4. Students are able to make use of knowledge on Web,HTTP.
5. Students will gain knowledge about Network security.

UNIT No	Syllabus Content	No of Hours
1	**Network Layer-1:**:Internetworking: Need for Network Layer, Internet as a datagram network ,IPV4 Addresses: Address space, Notation, classful addressing, Network Address Translation,Datagram,Fragmentation, IPV6 Addresses: Stucture,Packet format, Extention headers ,Advantages, ,Transition from IPV4 TO IPV6.	8
2	**Network Layer-2:**ICMP, Forwarding, Unicast and Multi cast Routing Protocols **Transport Layer:** Process-to-process communication ,User datagram protocol,Transmission Control Protocol,data traffic , congestion control	8
3	**Application Layer –I: Domain Name System (DNS**): Name Space, Domain name space, Distribution of name space , DNS in internet, Resolution, DNS messages, Types of record. Remote Logging: Telnet **E-mail**: Architecture, user agent, Message Transfer Agent(SMTP),MIME, Message Access Agent: POP and IMAP. FTP	8
4	**Application layer-II:World Wide Web and HTTP**: Architecture browser,server,URL,cookies;Web documents: Static dynamic, active documents.HTTP: HTTP transaction, persistent v/s non-persistent connection, proxy server. **Network Management System**: configuration, fault, performance, accounting management, SNMP: concept, management components, structure of MIB.	8
5	**Network Security:** Introduction, symmetric and asymmetric key cryptography, security services, message confidentiality, integrity.	7

Note 1: Unit 1 & Unit 3 will have internal choice.
Note 2: Three assignments are evaluated for 5 marks
      Assignment – I from Units 1 and 2.
       Assignment – II from Units 3 and 4 .
       Assignment -III from Unit 5

Course Outcomes:
After completion of course students will be able to:
CO1: Analyze the functionalities and services provided by network layer.
CO2: Design   network addresses and apply transport layer services..
CO3: Analyze the features and operations of various application layer protocols.
CO4:Implement the concepts of web,HTTP.
CO5: Understand the concepts of network security.

COs	Mapping with POs
CO1	PO1,PO2,PO5,PO12
CO2	PO1,PO2,PO3,PO4,PO12
CO3	PO1,PO2,PO6,PO7,PO12
CO4	PO1,PO2,PO5,PO7,PO12
CO5	PO1,PO2,PO3,PO6,PO7,PO12

TEXT BOOK:

Behrouz A. Forouzan: Data Communications and Networking, 5th Edition, Tata McGraw-Hill,2013.

REFERENCE BOOKS / WEBLINKS:

1. William Stallings **,**Data and Computer Communication, , 8th Edition, Pearson Education, 2007.
2. Larry L. Peterson and Bruce S. David **,**Computer Networks: A Systems Approach **-**, 4th Edition, Elsevier, 2007.
3. Wayne Tomasi **,**Introduction to Data Communications and Networking –, Pearson Education, 2005.
4. Nader F. Mir **,**Computer and Communication Networks –, Pearson Education, 2007.
5. Alberto Leon, Garcia, Indra Widjaja: Communication Networks: Fundamental Concepts and Key Architectures**,** 3rd Edition, Tata McGraw- Hill, 2011.
6. http://www.digi.com/resources/standards-and-technologies/rfmodems/zigbee-wireless-standard
7. http://www.rfwireless-world.com/Tutorials/Zigbee_tutorial.html

Sub Title : ARTIFICIAL INTELLIGENCE		
Sub Code:IS651	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. Understand about agent, behavior and structure
2. Learn different search strategies
3. Representation of knowledge and reasoning
4. Gain knowledge about planning and learning strategies

Unit No.	Syllabus Content	No. of Hours
1	Intelligent agents: Agents and environments, good behavior, concept of rationality, nature of environments, structure of agents	10
2	Problem-solving through Search: Problem solving agents, searching for solutions, uninformed search strategies, A*, minimax	10
3	Knowledge Representation and Reasoning: ontologies, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, syntax and semantics of first order logic, Propositional vs. Fist order inference, Forward chaining and backward chaining.	11
4	Planning: planning as search, partial order planning, construction and use of planning graphs	10
5	Machine Learning and Knowledge Acquisition: forms of learning, inductive learning, learning decision trees, Learning nearest neighbor, Reinforcement learning, passive and active RL.	11

Note 1: Unit 3 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
        Assignment – I from Units 1 and 2.
        Assignment – II from Units 3 and 4 .
        Assignment -III from Unit 5

Course Outcomes:
After completing the course the students are able to:

CO1: Identify agent and environment.
CO2: Apply   different Search strategies in problem solving .
CO3: Represent knowledge and perform reasoning.
CO4: Apply Planning strategies and machine learning techniques.

COs	Mapping with POs
CO1	PO1,PO12
CO2	PO7,PO12
CO3	PO1,PO2
CO4	PO5,PO7,PO12

TEXT BOOK:

Artificial Intelligence: A Modern Approach, 3rd Edition, by Stuart Russell and Peter Norvig.2.1,2.2,2.3,2.4,3.1,3.3,3.4,4.1,4.2,6.2,8.1,8.2,9.1,9.3,9.4,10.1,10.2,10.3,10.4,11.2, 11.3,11.4,18.1,18.2,18.3,19.3,20.4,21.1,21.2,21.3)

REFERENCE BOOKS:

1. Luger, G. F., & Stubblefield, W. A., Artificial Intelligence - Structures and Strategies for Complex Problem Solving. New York, NY: Addison Wesley, 5th edition (2005).
2. Nilsson, N. J. Artificial Intelligence - A Modern Synthesis. Palo Alto: Morgan Kaufmann. (1998).
3. Nilsson, N. J., Principles of Artificial Intelligence. Palo Alto, CA: Tioga (1981).
4. Rich, E., & Knight, K., Artificial Intelligence. New York: McGraw-Hill (1991).

Sub Title : COMPILER DESIGN		
Sub Code: IS652	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 04
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. To acquire the knowledge of compiler & its features.
2. To enrich the knowledge in various phases of compiler.
3. To introduce the underlying concepts in the design and implementation of language processors.
4. To learn the code optimization techniques to improve the performance of a program in terms of speed & space.

UNIT No.	Syllabus Content	No. of Hours
1	**Introduction, Lexical analysis:** Language processors; The structure of a Compiler; Applications of Compiler technology. **Lexical analysis:** The Role of Lexical Analyzer; Specifications of Tokens; Recognition of Tokens; The lexical analyzer Generator- LEX.	10
2	**Syntax Analysis – 1:** Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing. Recursive descent parser and Predictive parser.	12
3	**Syntax Analysis – 2:** Bottom-up Parsing; Introduction to LR Parsing: Simple LR parser; More powerful LR parsers; Using ambiguous grammars; Parser Generators.	12
4	**Syntax-Directed Translation:** Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes. **Intermediate Code Generation:** Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Algorithm for unification.	10
5	**Code Generation:** Issues in the design of Code Generator; The Target language; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.	8

Note 1: Unit 2 & 3 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes
After completing the course the students are able to:

CO1: Analyze concrete view on the theoretical aspects of compiler design.
CO2: Apply ideas and techniques discussed to various software designs.
CO3: Recognize and identify the phases of compiler with respect to design.
CO4: Demonstrate the syntax analysis and error correction strategies.
CO5: Discuss optimization of the code and apply optimization techniques for code samples.

COs	Mapping with POs
CO1	PO1, PO3, PO5, PO10, PO12.
CO2	PO3, PO5, PO9, PO10, PO12
CO3	PO2,PO3, PO5, PO9, PO10
CO4	PO2,PO3, PO5, PO9, PO10
CO5	PO2,PO3,PO10, PO12

TEXT BOOK:

Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, Compilers- Principles, Techniques and Tools - 2nd Edition, Addison-Wesley, 2010.

REFERENCE BOOKS/WEB LINKS:

1. Torben , Ægidius Mogensen, Basics of Compiler Design, ISBN 978-87-993154-0-6, Published through lulu.com, 2010.
2. Compiler Construction Principles & Practice - Kenneth C Louden, Thomson Education, 2007.
3. Nandini Prasad K S, Principles of Compiler Design - 3rd Edition, Elsevier Publication, 2014.

Sub Title : PYTHON PROGRAMMING		
Sub Code:IS653	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. Understanding the syntax and semantics of the Python language.
2. To create Functions in Python.
3. To handle Files & Regular expressions in Python.
4. To apply Object Oriented Programming concepts in Python.
5. To create Threaded and Networking applications in Python .

Unit No.	Syllabus Content	No of Hours
1	Introduction to Python, Writing First python program, Datat ypes in Python, Operators in python, Input and output, Control statements	10
2	Arrays in Python, Strings and characters, Functions, Lists and Tuples, Dictionaries	10
3	Files in Python, , Exceptions, Regular Expressions, Date and Time, modules and packages	10
4	Introduction to OOPS, Classes and Objects, Inheritance and Polymorphism, Abstract classes and Interfaces	10
5	Data Structures in Python, Threads, Networking in Python, Python Database Connectivity	12

Note 1: Unit 4 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
   Assignment – I from Units 1 and 2.
   Assignment – II from Units 3 and 4 .
   Assignment -III from Unit 5

Course Outcomes:
After the completion of course the student will be able to:

CO1: Demonstrate the understanding and usage of core python scripting elements python
   constructs, data types
CO2 :Demonstrate the understanding and usage of functions ,lists,tuples and dictionaries.
CO3: Demonstrate the understanding and usage of modules, packages and regular
   expressions
CO4: Demonstrate usage of object oriented features such as Inheritance, Polymorphism, operator overloading.
CO5:Apply the knowledge of python and use the language scripting elements and constructs to
   develop threaded and networking applications.

COs	Mapping with POs
CO1	PO1,PO2,PO4
CO2	PO1,PO2,PO4
CO3	PO1,PO2,PO4,PO5,PO8
CO4	PO1,PO2,PO4,PO5,PO8
CO5	PO1,PO2,PO4,PO5,PO8

TEXT BOOK :

Introducing Python- Modern Computing in Simple Packages – Bill Lubanovic, O'Reilly Publication 2015

REFERENCE BOOKS/WEB LINKS:

1. How to Think Likea Scientist–Learning withPython ",AllenDowney, JeffreyElkner, Chris Meyers,Green TeaPress, 2012, ThirdEdition.

2. Introduction to Computer ScienceUsingPython-Charles Dierbach, WileyPublication Learning with Python ",Green TeaPress, 2014,First Edition.

3. BeginningPython –From Noviceto Professional,-MagnusLie Hetland, Second Edition, APressPublication 2014.

Sub Title : MACHINE LEARNING		
Sub Code:IS654	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. To understand the basic concepts of machine learning along with decision trees. 2. To understand the neural networks and genetic algorithms 3. To differentiate between supervised learning and semi- Supervised learning 4. Obtain knowledge about various applications of learning.

UNIT No.	Syllabus Content	No. of Hours
1	**INTRODUCTION and MACHINE LEARNING BASICS**: **Introduction:** A brief overview of machine learning, Machine learning: what and why? , Key tasks in machine learning, Why you need to learn about machine learning, Steps in developing a machine learning application; Supervised learning; Unsupervised learning; Some basic concepts in machine learning. **Machine learning basics:** Classifying with k-Nearest Neighbors (kNN), Example: Using kNN on handwriting recognition system; Examples of Machine Learning Applications, An Overview: Learning Associations, Classification, Regression, Reinforcement Learning.	11
2	**DECISION TREES:** Learning Problems, Designing Learning systems, Perspectives and Issues, Concept Learning Tasks, Version Spaces and Candidate Elimination Algorithm, Decision Tree Representation – Basic Decision Tree Learning Algorithm – Heuristic Space Search.	10
3	**NEURAL NETWORKS and GENETIC ALGORITHMS:** Neural Network Representation, Problems, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Genetic Algorithms.	10
4	**SUPERVISED LEARNING**: The Supervised Learning Scenario, Overview of Classification Strategies, Evaluating Text Classifiers, Nearest Neighbor Learners, Feature Selection, Bayesian Learners, Exploiting Hierarchy among Topics. **SEMI-SUPERVISEDLEARNING**: Expectation Maximization, Labeling Hypertext Graphs and Co- training.	10
5	**APPLICATIONS:** Social Network Analysis- Social Sciences and Bibliometry –Evaluation of Topic Distillation- Measuring and Modeling the Web – Resource Discovery –Topical Locality and Focused Crawling – Discovering Communities- The Future of Web Mining; Machine learning in MapReduce; Machine Learning Applications to Internet of Things (IoT); Machine Learning for: Big Data, Smart Computing Environmental applications and others.	11

Note 1: Unit 1 & Unit 5 will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:
 Assignment – I from Units 1 and 2.
 Assignment – II from Units 3 and 4 .
 Assignment -III from Unit 5

Course Outcomes:

After completing the course the students are able to:

CO1: Choose the learning techniques with this basic knowledge.

CO2: Obtain knowledge on decision tree learning.

CO3: Apply and comprehend neural network and genetic algorithms techniques.

CO4: Obtain knowledge about supervised and semi- supervised learning.

CO5: Differentiate different machine learning applications.

COs	Mapping with POs
CO1	PO1,PO2
CO2	PO2,PO12
CO3	PO3,PO4,PO5
CO4	PO2,PO3,PO4,PO5
CO5	PO3,PO4,PO5,PO12

TEXT BOOKS:

1. Kevin P. Murphy, "Machine Learning A Probabilistic Perspective", The MIT Press, 2012.
2. Peter Harrington , "Machine Learning in Action", MANNING Shelter Island Publication, ISBN 9781617290183, 2012.
3. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education , 2013.

REFERENCE BOOKS/ WEBSITES:

1. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.
3. http://www.cs.wustl.edu/~jain/cse570-15/ftp/iot_ml/

Sub Title : INFORMATION SYSTEMS		
Sub Code:IS655	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 4
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. Introduce to various types of information systems , issues and concepts related to it.
2. Understand about electronic and enterprise business system management .
3. Familiarize the need and benefits of E-Business, ERP, E-Commence, SCM, DSS.
4. Understand about Security management of IT, Enterprise and Global Management of IT.

UNIT No.	Syllabus Content	No of Hours
1	**Foundation concepts – 1:** Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT. System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems **Foundation Concepts – 2:** Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge-creating company.	10
2	**Electronic Business Systems:** Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems. **Enterprise Business Systems:** Customer relationship management: Introduction, What is CRM? Benefits and challenges of CRM, Trends in CRM.	12
3	**Enterprise resource planning:** Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM. **Electronic Commerce Systems:** Electronic commerce fundamentals: Introduction, The scope of e-commerce, Essential e-commerce, processes, and Electronic payment processes. E-commerce application trends, Business-to- Consumer e-commerce, Business-to-Business e-commerce, e-commerce marketplaces	10
4	**Decision Support Systems:** Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, On-line analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support.	10
5	**Decision Support Systems contd:** Knowledge management systems, Business and Artificial Intelligence (AI).	10

| | **Security management of IT:** Introduction, Tools of security management, Internetworked security defenses, Other security measures, System Controls and audits. **Enterprise and Global Management of IT:** Managing IT: Business and IT, Managing IT, Business / IT planning, Managing the IS function. | |

Note 1: Unit 2 & Unit 3 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course outcomes:
After completing the course the students are able to:
CO1: Analyze the components, activities and strategies of Information system.
CO2: Apply planning and maintenance strategies to the information systems
CO3: Apply the technologies such as ERP, E-Business and E-Commerce, m-Commerce, wireless networks, mobile computing etc.
CO4: Identify the threats to information security and protect information resources.

COs	Mapping with POs
CO1	PO2,PO7,PO12
CO2	PO2,PO3,PO6,PO7,PO9,PO11
CO3	PO2,PO3,PO6,PO7,PO9,PO11
CO4	PO6,PO7,PO9,PO11

TEXT BOOK:

  James A. O' Brien, George M. Marakas - Management Information Systems -, 7th Edition, Tata McGraw Hill, 2006.

REFERENCE BOOKS:

1. Kenneth C. Laudon and Jane P. Laudon - Management Information System, Managing the Digital Firm -, 9th Edition, Pearson Education, 2006.
2. Steven Alter - Information Systems The Foundation of E-Business , 4th Edition, Pearson Education, 2002.
3. W.S. Jawadekar - Management Information Systems -, Tata McGraw Hill 1998.

Sub Title : CRYPTOGRAPHY AND NETWORK SECURITY		
Sub Code:IS656	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5+ 50 =100**	**Total No. of Contact Hours :52**

Course Objectives:

1. To understand the fundamentals of Cryptography .
2. To acquire knowledge on standard algorithms used to provide security.
3. To understand the various key distribution and management schemes.
4. To gain knowledge of securing data in transit across networks.

UNIT No	Syllabus Content	No of Hours
1	**Classical Encryption Techniques** Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad,Transposition Techniques **Block Ciphers and the data encryption standard:** Traditional block Cipher structure: stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher; The data encryption standard:DES encryption, DES decryption; avalanche effect; strength of DES: the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks; Block cipher design principles: number of rounds, design of function F, key schedule algorithm.	12
2	**Public-Key Cryptography and RSA:** Principles of public-key cryptosystems: Public-key cryptosystems, Applications for public-key cryptosystems, requirements for public-key cryptosystems, public-key cryptanalysis. The RSA algorithm: description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack.	10
3	**Key Management and Distribution**: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates.	10
4	**User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4 **Electronic Mail Security**: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing.	10
5	**IP Security:** IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating	10

| | Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes
Transport Level Security: Web security considerations:Web security threats, Web Traffic security approaches
Secure sockets layer: SSL architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert protocol, hand shake protocol | |

Note 1: Unit 1 & Unit 5 will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:
   Assignment – I from Units 1 and 2.
   Assignment – II from Units 3 and 4 .
   Assignment -III from Unit 5

Course Outcomes:
After the completion of the above course students will be able to

CO1: Analyze substitution and transposition techniques.
CO2: Design and analyze public key cryptosystems.
CO3: Describe various key distribution and management schemes.
CO4: Analyze different methods of user authentication
CO5: Secure data in transit across network by using appropriate protocol.

COs	Mapping with POs
CO1	PO2,PO4,PO9,PO12
CO2	PO2,PO3, PO6,PO9,PO12
CO3	PO2,PO9,PO12
CO4	PO2,PO4,PO6,PO9,PO12
CO5	PO2,PO6,PO9,PO12

TEXT BOOK:

William Stallings: Cryptography and Network Security, Principles and Practice Pearson, 6th edition 2014.

REFERENCE BOOK:

Behrouz A. Forouzan: Cryptography and Network Security Tata-Macgraw Hill 2007

Sub Title : NETWORKS LAB		
Sub Code: ISL66	No. of Credits:1 : 0:0:1(L-T-P)	No. of lecture hours/week :2
Exam Duration : 3 hours	Exam Marks:CIE + SEE = 50 + 50 =100	

Course Objectives:

1. Construct sample networks with different topologies and configurations.
2. Analysis of the network behavior with respect to different parameters and conditions.
3. Build programs to implement error detection techniques and congestion control techniques.
4. Construct programs to build optimal routing table.
5. Build programs to implement the specified security algorithms

I. LIST OF PROGRAMS

PART A

The following experiments shall be conducted using either NS228/OPNET or any other suitable simulator.

1. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network with the links connected as follows:
   n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
4. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.
5. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

PART-B
Implement the following in C/C++:

1. Write a program for error detecting code using CRC-CCITT (16- bits).
2. Write a program for distance vector algorithm to find suitable path for transmission.
3. Implement Diffie-Hellman Key exchange algorithm.
4. Write a program for simple RSA algorithm to encrypt and decrypt the data.
5. Write a program for congestion control using leaky bucket algorithm.

II. OPEN ENDED QUESTIONS

Develop/ Simulate the following applications:
1. Shortest Path from source to destination
2. File Transfer
3. Remote Login
4. Any other network and/or security application.
5. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.

NOTE:

1.STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.

2. STUDENT IS REQUIRED TO SOLVE ONE PROBLEM FROM PART-A AND ONE PROBLEM FROM PART-B. THE QUESTIONS ARE ALLOTTED BASED ON LOTS. BOTH QUESTIONS CARRY EQUAL MARKS.

Course Outcomes:
After completing the course the students are able to:

CO1: Simulate a sample network on a virtual screen.
CO2: Design and **a**nalyze the network behavior against various parameters through simulation
CO3: Demonstrate error detection, congestion control techniques
CO4: Implement an optimal routing table and apply security algorithms for a given network.
CO5: Demonstrate the file transfer using sockets

COs	Mapping with POs
CO1	PO1,PO2,PO5,PO9,PO12
CO2	PO1,PO2,PO9,PO12
CO3	PO1,PO2,PO4,PO9,PO12
CO4	PO1,PO6,PO9,PO12
CO5	PO1,PO2,PO5,PO6,PO9,PO12

Sub Title : CLOUD COMPUTING LAB		
Sub Code:ISL67	No of Credits : 0:0:1 (L:T:P)	No. of lecture hours/week : 02
Exam Duration : 3 hours	Exam Marks: CIE + + SEE = 50 + 50 =100	

Course Objectives:

1. To understand the working and usage of different cloud service models.

2. To study the basic understanding of Installation and Configuration of Cloud environment.

3. To understand the concept of Service Model and its usage in Cloud Computing.

4. To learn development of applications using IaaS, PaaS and SaaS.

5. Understand how Cloud environment works, for various deployment models

I. LIST OF PROGRAMS

CLOUD COMPUTING:

1. Demonstrate the working of Google Drive to make spreadsheet and notes.

2. Installation, Configuration and working on Justcloud.

3. Creating a Warehouse Application in SalesForce.com.

4 Creating an Application in SalesForce.com using Apex programming Language.

5. Implementation of Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual Box and   Guest O.S.

6. Demonstrate the working of Google Form to develop event feedback system.

7. Working and installation of Amazon Web Service.

II. OPEN ENDED QUESTIONS

1. Working with Mangrasoft Aneka Software.

2. Installation and Configuration of Hadoop/Eucalyptus or any equivalent cloud software.

3. Design and implement Cloud based application(mini-project)

NOTE:
1.STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.
2. STUDENT IS REQUIRED TO EXECUTE ONE PROBLEM FROM THE LOT OF 7 QUESTIONS.

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

CO1: Analyze the requirements to setup: Cloud Environment using IaaS Environment

CO2: Develop the ability to solve real-world problems through software development on Cloud

Environment.

CO3: Implement, compile, test and run Java programs comprising on PaaS to address a particular

software problem.

CO4: Design and develop useful Cloud applications with elegant user interfaces using SaaS.

COs	Mapping with POs
CO1	PO1,PO2,PO5,PO7,PO11
CO2	PO1,PO2, PO5, PO7,PO12
CO3	PO1,PO7,PO9,PO10,PO12
CO4	PO1,PO2,PO6,PO9,PO12
CO5	PO1,PO5,PO6,PO7,PO11

Sub Title : MINI PROJECT		
Sub Code:ISP68	No. of Credits:2=0 : 0 : 2 (L-T-P)	No. of lecture hours/week : 2
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 =100	

Sub Title : MINI PROJECT		
Sub Code:ISP68	No. of Credits:2=0 : 0 : 2 (L-T-P)	No. of lecture hours/week : 2
Exam Duration : 3 hours	Exam Marks: CIE + SEE = 50 + 50 =100	

Detailed Scheme and Syllabus

ACADEMIC YEAR   2018-2019

VII - VIII (2015-2019 BATCH)

Dr. Ambedkar Institute of Technology
Bangalore

Department Of
Information Science and Engineering

Vision

- To create **D**ynamic, **R**esourceful, **A**dept and **I**nnovative **T**echnical professionals to meet global challenges.

Mission

- To offer state-of-the-art undergraduate, postgraduate and doctoral programmes in the fields of Engineering, Technology and Management.
- To generate new knowledge by engaging faculty and students in research, development and innovation
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet industry requirements.
- To install moral and ethical values with social and professional commitment.

DEPARTMENT VISION AND MISSION

Vision:

- Imparting quality technical education and preparing professionals to meet Information Technological challenges globally.

Mission:

- Prepare highly capable Information Science engineers through best practices.
- Encourage students to pursue higher education for further growth in the learning process and to promote research in the frontier areas of Information Technology.
- Educate students to take up social and professional responsibilities with ethical values for the betterment of the society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1: Graduates will have the ability to become successful computing professionals in the area of Information Technology.
PEO2: Graduates will be equipped to enhance their knowledge through core engineering subjects to promote lifelong learning.
PEO3: Graduates will be able to take up social, technical and entrepreneurial challenges.

PROGRAMME OUTCOMES (POs)

1. Ability to apply the knowledge of computing, mathematics, basic sciences and engineering fundamentals for the solution of engineering related problems.

2. Identify, specify and formulate comprehensive solution to complex engineering problems.

3. Design and develop computing systems to meet the specified needs of engineering problems by considering societal and environmental implications.

4. Ability to conduct experiments, analyze and interpret data to provide valid conclusions for problems in Information Science and Engineering

5. Ability to identify and solve computational problems using modern technologies and tools.

6. An understanding to assess societal, health, safety, legal issues relevant to professional engineering practices.

7. Understanding the impact of IT solutions in society and environment for sustainable development.

8. Apply and commit to professional ethics in engineering practices.

9. An ability to work as an individual, as a member and /or leader in diverse teams.

10. Ability to communicate effectively both in written and oral communication.

11. Ability to understand the importance of finance and project management as an individual and/or through team work.

12. Develop a conducive environment to engage in lifelong learning.

Academic Year 2018-2019 : VII Semester
SCHEME OF TEACHING AND EXAMINATION
B.E. INFORMATION SCIENCE AND ENGINEERING

S. No.	Subject Code	Subject	Teaching Dept.	Hrs/week				Examination		
				Lecture	Tutorial	Practical		Marks		
							CIE /Assignment	SEE	Credits	Total
1	IS71	Software Architectures	ISE	04			45/5	50	4	100
2	IS72	Internet of Things	ISE	04			45/5	50	4	100
3	IS73	Big Data Analytics	ISE	04			45/5	50	4	100
4	IS74x	Elective II (Group-B)	ISE	04			45/5	50	4	100
5		Inter Departmental Elective	ISE	04			45/5	50	4	100
6	ISL75	Mobile Application Development lab	ISE	-		2	50	50	1	100
7	ISL76	Big Data Lab	ISE	-		2	50	50	1	100
8	ISP77	Project Phase-I	ISE	-				-	-	-
		Total		19		04	350	350	22	700

Elective II – Group B
IS741   Advanced DBMS
IS742   Object Oriented Modeling and Design
IS743   Storage Area Networks
IS744   C# Programming and .Net

Elective III – Group C   (Inter Departmental Elective)
ISE01   Wireless Sensor Networks
ISE02   Information Systems
ISE03   Protocol Engineering

HEAD
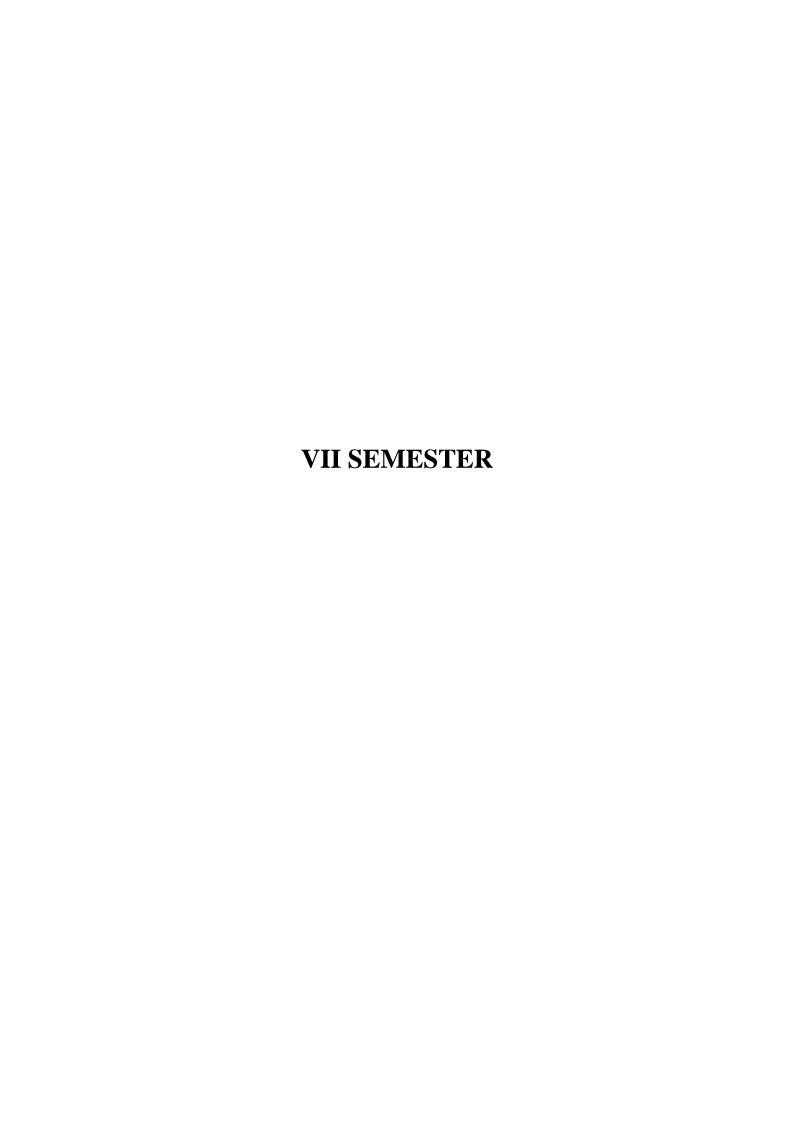DEPT. OF INFORMATION SCIENCE & ENGG.

Academic Year 2018-2019 : VIII Semester
SCHEME OF TEACHING AND EXAMINATION
B.E. INFORMATION SCIENCE AND ENGINEERING

VIII Semester

S. No.	Subject Code	Subject	Teaching Dept.	Hrs/week				Examination		
				Lecture	Tutorial	Practical		Marks		
							CIE /assignment	SEE	Credits	Total
1	HS04	Intellectual Property Rights	ISE	02			45/5	50	2	100
2	IS81	Software Testing	ISE	04			45/5	50	4	100
3	IS82x	Elective IV(Group-D)	ISE	04			45/5	50	4	100
4		Inter Departmental Elective		04			45/5	50	4	100
5	ISP83	Project Phase-II	ISE	-			50	50	12	100
6	ISS84	Seminar	ISE	-			50	-	2	50
		Total		14			300	250	28	550

Elective IV – Group D

IS821	Wireless Sensor Networks
IS822	Protocol Engineering
IS823	**Machine Learning and Applications**

Elective V– Group E (Inter Departmental Elective)

ISE04	Internet Programming
ISE05	Artificial Intelligence
ISE06	Java Programming

HEAD
DEPT. OF INFORMATION SCIENCE & ENGG.

VII SEMESTER

Sub Title : SOFTWARE ARCHITECTURES		
Sub Code: IS71	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:
1. Introduction to the fundamentals of software architecture.
2. Software architecture and quality requirements of a software system
3. Fundamental principles and guidelines for software architecture design, architectural styles, patterns, and frameworks.
4. Methods, techniques, and tools for describing software architecture and documenting design rationale.
5. Software architecture design and evaluation processes.

Unit No.	Syllabus Content	No of Hours
1	Introduction: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views. Architectural Styles and Case Studies: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.	12
2	Quality: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles. Architectural Patterns – 1: Introduction; from mud to structure: Layers, Pipes and Filters, Blackboard.	10
3	Architectural Patterns – 2: Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. Architectural Patterns – 3: Adaptable Systems: Microkernel; Reflection.	10
4	Some Design Patterns: Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy.	10
5	Designing and Documenting Software Architecture: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system.	10

	Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.	

Note 1: Unit 1 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes:
After the completion of course the student will be able to:

    CO1: Argue the importance and role of software architecture in large scale software systems
    CO2: Design and motivate software architecture for large scale software systems
    CO3: Recognize major software architectural styles, design patterns, and frameworks
    CO4: Describe a software architecture using various documentation approaches and architectural
        description languages
    CO5: Evaluate the coming attractions in software architecture research and practice.

COs	Mapping with POs
CO1	PO1,PO2, ,PO9
CO2	PO1,PO2, PO4,PO5, PO9
CO3	PO1, PO4,PO5, PO9
CO4	PO1,PO2,PO3, PO4, PO9
CO5	PO1, PO4, PO9,PO10

TEXT BOOKS

1. Software Architecture in Practice - Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Education, 2003.
2. Pattern-Oriented Software Architecture A System of Patterns, Volume 1 - Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons, 2006
3. Software Architecture- Perspectives on an Emerging Discipline - Mary Shaw and David Garlan, Prentice-Hall of India, 2007.

REFERENCE BOOKS/WEB LINKS:

Design Patterns- Elements of Reusable Object-Oriented Software - E. Gamma, R. Helm, R. Johnson, J. Vlissides, Addison-Wesley, 1995.

Course Title : INTERNET OF THINGS		
Course Code:IS72	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 4
Exam Duration : 3 hours	CIE + SEE = 50 + 50 =100	Total No. of Contact Hours :52

Course Objectives
1. To learn the basic issues, policy and challenges in the IoT 2. To understand the Mechanism and Key Technologies in IoT 3. To analyze the managing of the resources in the IoT 4. To deploy the resources into business 5. To comprehend Data Analytics for IoT

UNIT No	Syllabus Content	No of Hours
1	**Introduction to IoT** Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network	12
2	**Fundamentals IoT** Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches,IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Lowpower .	10
3	**Challenges in IoT** Design challenges, Development challenges, Security challenges, Other challenges	10
4	**Domain specific applications of IoT** Home automation, Industry applications, Surveillance applications, Other IoT applications	10
5	**Data Analytics for IoT**– Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.	10

Note 1: Unit 2 & Unit 5 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course outcomes:

On successful completion of the course, the student will

CO1: Understand the concepts of Internet of Things.

CO2: Identify different technologies of IoT with machine type communication.

CO3: Design IoT applications in different domain and be able to analyze their performance.

CO4: Implement basic IoT applications on embedded platform.

CO5:Understand data sets received through IoT devices and tools used for analysis

COs	Mapping with PO's
CO1	PO3,PO4,PO5,PO6,PO9,PO10
CO2	PO3,PO4,PO5,PO6,PO7,PO9,PO10
CO3	PO4,PO6,PO7,PO8,PO9,PO11
CO4	PO4,PO5,PO8,PO9,PO10,PO11
CO5	PO4,PO5,PO6,PO7,PO9,PO10

TEXT BOOK:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things : A Hands on Approach" Universities Press., 2015
2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications", Wiley, 2013

REFERENCE BOOKS/WEBLINKS

1.Michael Miller," The Internet of Things", First Edition, Pearson, 2015.
2.Claire Rowland,Elizabeth Goodman et.al.," Designing Connected Products", First Edition,O'Reilly, 2015

Sub Title : BIG DATA ANALYTICS		
Sub Code: IS73	**No. of Credits: 4 =4 : 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**CIE +Assignment + SEE =** 45 + 5 + 50 =100	**Total No. of Contact Hours :** 52

Course Objectives:

1. To impart fundamental concepts about data and its identification.
2. Understand the basic concepts of Big data, methodologies for analyzing structured and unstructured data.
3. Discuss different technologies used for Big data along with its architecture.

Unit No.	Syllabus Content	No. of Hours
1	**Providing Structure to Unstructured Data:** Background, Machine Translation, Autocoding, Indexing and Term Extraction. **Identification, Deidentification, and Reidentification:** Background, Features of an Identifier System, Registered Unique Object Identifiers, Really Bad Identifier Methods, Embedding Information in an Identifier: Not Recommended, One-Way Hashes, Use Case: Hospital Registration, Deidentification, Data Scrubbing, Reidentification. **Ontologies and Semantics:** Background, Classification, the Simplest of Ontologies, Ontologies, Classes with Multiple Parents, Choosing a Class Model, Introduction to Resource Description Framework Schema, Common Pitfalls in Ontology Development. **Data Integration and Software Interoperability:** Background, The Committee to Survey Standards, Standard Trajectory, Specifications and Standards, Versioning, Compliance Issues, Interfaces to Big Data Recourses.	12
2	**Immutability and Immortality:** Background, Immutability and Identifiers, Data Objects, Legacy Data, Data Born from Data, Reconciling Identifiers across Institutions, Zero-knowledge Reconciliation, The Curator's Burden. **Simple but Powerful Big Data Techniques:** Background, Look at the Data, Data Range, Denominator, Frequency Distributions, Mean and Standard Deviation, Estimation-Only Analyses, Use Case: Estimating Move Preferences.	8
3	**Getting Value Predictive Analytics and Big Data:** Why Do Predictive Analytics on Big Data?; Moving Predictive Analytics to the Front Lines; Gaining Real Business Value from Predictive Analysis; Publishing Data and Analytics to Cloud Service. **Ten Things to Consider with Big Data Analytics**. **Analytics and Big Data:** Using Big Data to Get Results; Basic analytics; Advanced analytics.	10
4	**Analysis:** Background, Analytic Tasks, Clustering, Classifying, Recommending, and Modeling, Data Reduction, Normalizing and Adjusting Data, Big Data Software: Speed and Scalability, Find Relationships, Not Similarities. **Special Considerations in Big Data Analysis:** Background, Theory in	10

	Search of Data, Data in Search of Theory, Overfitting, Too Much Data, Fixing Data, Data Subsets in Big Data: Neither Additive nor Transitive, Additional Big Data Pitfalls.	
5	**Stepwise Approach to Big Data Analysis.** **Big Data Infrastructures ,Technologies and Applications:** Hadoop: Architecture, Introduction to MapReduce; HDFS: Architecture; R language: Programming features, Examples; Zookeeper; MongoDB. **Other Hadoop Related tools: Hbase:** Data model and implementations – Hbase clients – Hbase examples –praxis; **Cassandra :** Cassandra data model –Cassandra examples – Cassandra clients –Hadoop integration; **PIG:** Grunt – Pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries. **Big Data Applications:** Healthcare, Insurance industry, Telecom services, Financial services, Retail, Marketing etc.	**12**

Unit 1 & Unit 5 will have internal choice.

Note : Three Assignments are evaluated for 5 marks:
>   **Assignment – I from Units 1 and 2.**
>   **Assignment – II from Units 3 and 4 .**
>   **Assignment -III from Unit 5**

Course Outcomes:

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

CO1: Identify the differences between Big data & small data and structured & unstructured data. Also, analyze the Ontologies and Measurement techniques of Big data along with data integration.

CO2: Discuss about various powerful Big data techniques.

CO3: Differentiate between Statistics, Data Mining & Analytics.

CO4: Apply special considerations in Big Data Analysis along with stepwise approach in Big Data analytics.

CO5: Discuss different infrastructure & technologies for Big Data and its applications.

COs	Mapping with POs
CO1	PO2, PO3, PO4, PO12.
CO2	PO2, PO3, PO12
CO3	PO2,PO3, PO4, PO9
CO4	PO2,PO3, PO9
CO5	PO3,PO4, PO5, PO10, PO12

TEXT BOOKS:

1. Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Jules.J. Berman, First Edition, MK Publishers, 2013.

2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, Big Data For Dummies, Published by John Wiley & Sons, Inc., 2013.

3.Unit 5 (Not limited to following resource) :
   i.Challenges and Opportunities with Big Data by Divyakant Agrawal et al , Whitepaper, 2011.

REFERENCE BOOKS/WEB LINKS:

1. Ken W. Collier, Agile Analytics: A Value-Driven Approach to Business Intelligence and Data Warehousing, Author: Pearson Education, ISBN-13:-9788131786826,2012
2. Michael Wessler, Big Data For Dummies, Published by John Wiley & Sons, Inc. ,Alteryx Special Edition,2013.
3. Big Data Applications: http://www.nasscom.in.
4. Big Data case studies:
   i. http://racunarstvo.hr/wp-content/uploads/2016/03/OA_day_Big_Data_Tomasz_Przybysewski.pdf.
   ii. https://www.datameer.com/pdf/eBook-Top-Five-High-Impact-UseCases-for-Big-Data-Analytics.pdf

Sub Title : ADVANCED DBMS		
Sub Code:IS741	No. of Credits:4=4 : 0 : 0 (L-T-P)	No.of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. Understand the internal data structures and extend this knowledge to external data structures.
2. To examine how data storage technology works.
3. Acquire the knowledge of storing data on external storage.
4. Acquire the knowledge of file organizations and indexing

Unit No.	Syllabus Content	No of Hours
1	**Overview of Storage and Indexing, Disks and Files** : Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning Memory hierarchy; RAID; Disk space management; Buffer manager; Files of records; Page formats and record formats **Tree Structured Indexing:** Intuition for tree indexes; Indexed sequential access method; B+ trees, Search, Insert, Delete, Duplicates, B+ trees in practice	12
2	**Hash-Based Indexing:** Static hashing; Extendible hashing, Linear hashing, comparisons **Overview of Query Evaluation, External Sorting :** The system catalog; Introduction to operator evaluation; Introduction to query optimization; Alternative plans: A motivating example; what a typical optimizer does. When does a DBMS sort data? A simple two-way merge sort; External merge sort	10
3	**Evaluating Relational Operators** : The Selection operation; General selection conditions; The Projection operation; The Join operation; The Set operations; Aggregate operations; The impact of buffering **A Typical Relational Query Optimizer:** Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Nested sub-queries	10
4	**Physical Database Design:** Introduction; Guidelines for index selection, examples; Clustering and indexing; Indexes that enable index-only plans; Tools to assist in index selection;	10
5	**More Recent Applications:** Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management	10

Note 1: Unit 1& Unit 2 will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:
  Assignment – I from Units 1 and 2.
  Assignment – II from Units 3 and 4 .
  Assignment -III from Unit 5

Course Outcomes:

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

CO1: Analyze basic database storage structures and access techniques
CO2: Apply relational algebraic techniques to create queries.
CO3: Evaluate and optimize queries through various techniques .
CO4: Identify issues regarding emerging database technologies.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO5
CO2	PO1,PO2,PO3,PO5,PO8
CO3	PO1,PO2,PO3,PO4,PO5,PO12
CO4	PO1,PO2,PO3,PO5,PO12

TEXT BOOKS:
1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2008.
2. Raghu Ramakrishna and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

REFERENCE BOOKS/WEBLINKS:

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education, 2006.

Sub Title : OBJECT-ORIENTED MODELING AND DESIGN		
Sub Code:IS742	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives:

1. Introduce students with the concept and terms used in Object Oriented Modelling .
2. Understand the importance of Object Oriented approach and UML notation .
3. Develop an understanding of Class, State and Interaction models.
4. Design and develop a system with Object Oriented approach.

Unit No	Syllabus Content	No of Hours
1	**Introduction, Modeling Concepts, class Modeling:** What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history Modeling as Design Technique: Modeling; abstraction; The three models. **Class Modeling**: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model ,practical tips	10
2	**Advanced Class Modeling**: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes , Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages **State Modeling**: Events, States, Transitions and Conditions; State diagrams; State diagram behavior. **Advanced State Modeling:** Nested state diagrams; Nested states; Signal generalization; Concurrency; Relation of class and state models	10
3	**Interaction Modeling:** Use case models; Sequence models; Activity models. Advanced Interaction Modeling: Use case relationships; Procedural sequence models; Special constructs for activity models. Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.	12
4	**Domain Analysis**: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. **Application Analysis**: Application interaction model; Application class model; Application state model; Adding operations. **System Design** Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common	10

| 5 | **Class Design**: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.
Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. | 10 |

(previous row above: architectural styles; Architecture of the ATM system as the example.)

Note 1: Unit 3 & Unit 4   will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

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

CO1: Identify objects, attributes and operations performed on the objects in real world situations
CO2: Design class and state models for a given problem.
CO3: Analyze and build interaction models for the system to be developed.
CO4: Design System using class and application domain.
CO5: Implement   system with OO approach.

COs	Mapping with Pos
CO1	PO1,PO2,PO3,PO7,PO12
CO2	PO1,PO2,PO3,PO4,PO12
CO3	PO1,PO2,PO3,PO4
CO4	PO1,PO2,PO3,PO4
CO5	PO1,PO2,PO3,PO4,PO7

TEXT BOOK:
    Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.
REFERENCE BOOKS/WEBLINKS:

1. Grady Booch et al , Object-Oriented Analysis and Design with Applications -, 3rd Edition, Pearson, 2007.
2. Mark Priestley,Practical Object-Oriented Design with UML - 2nd Edition, Tata McGraw-Hill, 2003.

3. K. Barclay, J. Savage ,Object-Oriented Design with UML and JAVA -, Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson ,The Unified Modeling Language User Guide - 2nd Edition, Pearson, 2005.

Sub Title : STORAGE AREA NETWORKS		
Sub Code: IS743	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. To understand the fundamentals of storage architecture along with storage virtualization.
2. To understand the metrics used for designing storage area networks.
3. To enable the students to understand RAID concepts.
4. To appreciate the use of cables technologies used in SAN technology.

Unit No.	Syllabus Content	No. of Hours
1	**Introduction:** Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages; Case study: Replacing a server with Storage Networks; The Data Storage and Data Access problem. **Intelligent Disk Subsystems:** Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems; The Physical I/O path from the CPU to the Storage System; SCSI.	12
2	**I/O Techniques:** The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system.	10
3	**File System and NAS:** Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS. **Storage Virtualization:** Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.	10
4	**SAN Architecture and Hardware devices:** Overview, creating a Network for storage; SAN Hardware devices, The Fibre channel switch, Host Bus adaptors; Putting the storage in SAN. **Software Components of SAN:** The switch's Operating system, Device Drivers, The Supporting the switch's components, Configuration options for SANs; Planning for business continuity.	10
5	**Management of Storage Network**: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management.	10

Note 1: Unit 1 & Unit 2 will have internal choice
Note 2: Three Assignments are evaluated for 5 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4 .
Assignment -III from Unit 5

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

CO1: Identify the need for storage networks and its advantages.
CO2: Recognize various RAID levels.
CO3: Apply the concept of storage virtualization and recognize steps for Business continuity
planning in an Enterprise.
CO4: Analyze SAN architecture along with the use of cables technologies.
CO5: Realize the concept of management of storage network.

COs	Mapping with POs
CO1	PO1, PO2, PO12
CO2	PO1, PO2
CO3	PO1,PO2,PO11
CO4	PO1,PO2,PO12
CO5	PO1, PO2,PO11, PO12

TEXT BOOKS:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley
, India, 2013
2. Robert Spalding: Storage Networks- The Complete Reference, Tata McGraw-Hill, 2011.

REFERENCE BOOKS/WEB LINKS:

1 Richard Barker and Paul Massiglia: Storage Area Network Essentials A Complete Guide to
understanding and Implementing SANs, Wiley India, 2006.
2.Marc Farley: Storage Networking Fundamentals **-** Cisco Press, 2005.

Sub Title : C# PROGRAMMING AND .NET		
Sub Code:IS744	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. Understand the nature of .Net application development and build C# applications.
2. Familiarize with Object-oriented Programming concepts as associated with C#, Inheritance, Interfaces, Exception Handling, Reflection, Standard I/O programming, File Handling, Generics,
3. Understand Windows Application using Winforms, File I/O, XML in .NET.Web Services and Deployment.
4. Overview of .NET framework 3.0 features like WPF, WCF and WF.

Unit No.	Syllabus Content	No of Hours
1	**The Philosophy Of .Net:** Understanding the Previous State of Affairs, The .NET Solution, The Building Block of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of .NET Binaries (aka Assemblies), the Role of the Common Intermediate Language , The Role of .NET Type Metadata, The Role of the Assembly Manifast, Compiling CIL to Platform –Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime A tour of the .NET Namespaces, Increasing Your Namespace Nomenclature, Deploying the .NET Runtime.	10
2	**Building C# Applications:** The Role of the Command Line Complier (csc.exe), Building C # Application using csc.exe Working with csc.exe Response Files, Generating Bug Reports , Remaining C# Compiler Options, The Command Line Debugger (cordbg.exe) Using the, Visual Studio .NET IDE, Other Key Aspects of the VS.NET IDE, C# "Preprocessor:" Directives, An Interesting Aside: The System. Environment Class. **C# Language Fundamentals:** The Anatomy of a Basic C# Class, Creating objects: Constructor Basics, The Composition of a C# Application, Default Assignment and Variable Scope, The C# Member Initialization Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node: System, Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, Defining Program Constants, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class Methods, Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C #, String Manipulation in C#, C# Enumerations, Defining Structures in C#, Defining Custom Namespaces.	12

3	**Object- Oriented Programming With C#:** Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo-Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The "Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between. **Exceptions And Object Lifetime:** Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception (System. System Exception), Custom Application-Level Exception (System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.	10
4	**Interfaces And Collections:** Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).	10
5	**Understanding .Net Assembles:** Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly.	10

Note 1: Unit 2 & Unit 3   will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4 .

Assignment - III from Unit 5

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

CO1:Analyze the nature of .Net application development .
CO2: Apply OOAD concepts to build C# applications
CO3: Design and develop console based applications using C#
CO4: Develop Windows Application using Winforms, File I/O, XML in .NET.Web Services
    and deployment.
CO5:Analyze .NET framework 3.0 features like WPF, WCF and WF.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO4,PO5,PO8,PO12
CO2	PO1,PO2,PO3,PO4,PO5,PO7,PO12
CO3	PO1,PO2,PO3,PO4,PO5,PO7,PO12
CO4	PO1,PO2,PO3,PO4,PO5,PO7,PO12
CO5	PO1,PO2,PO3,PO4,PO5,PO7,PO12

TEXT BOOKS:

1**.** Pro C# with .NET 3.0 **-** Andrew Troelsen, Special Edition, Dream Tech Press, India, 2013.

2. Programming in C# **-** E. Balagurusamy, 5th Reprint, Tata McGraw Hill, 2011.

REFERENCE BOOKS/WEB LINKS:
1. Inside C# **-** Tom Archer, WP Publishers, 2011.
2. The Complete Reference C# **-** Herbert Schildt, Tata McGraw Hill, 20014.

Sub Title : WIRELESS SENSOR NETWORKS		
Sub Code:ISE01	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. To learn about the issues in the design of wireless networks.

2. To understand the protocols used in sensor networks.

3. To expose students to different aspects in sensor networks.

4. To understand various security issues in ad hoc and sensor networks along with their issues.

Unit No.	Syllabus Content	No. of Hours
1	**Introduction:** Unique Constraints and Challenges, Advantages of Sensor Networks, Energy advantage, Detection advantage, Sensor Network Applications, Habitat monitoring, Wildlife conservation through autonomous, non-intrusive sensing, Tracking chemical plumes, Ad hoc, just-in-time deployment mitigating disasters, Smart transportation: networked sensors making roads safer and less congested, Collaborative Processing. **Key Definitions and The Problem:** Key Definitions of Sensor Networks, Canonical Problem: Localization and Tracking, Tracking Scenario, Problem Formulation.	12
2	**Key Definitions and The Problem contd..:** Sensing model, Collaborative localization, Bayesian state estimation, Distributed Representation and Inference of States, Impact of choice of representation, Design desiderata in distributed tracking, Tracking Multiple Objects, State space decomposition, Data association, Sensor Models, Performance Comparison and Metrics. **Networking and Protocols:** Networking Sensors, Key Assumptions, Medium Access Control, The SMAC Protocol, IEEE 802.15.4 Standard and ZigBee.	10
3	**Networking and Protocols cont..:** General Issues, Geographic, Energy-Aware Routing, Unicast Geographic Routing, Routing on a Curve, Energy-Minimizing Broadcast, Energy- Aware Routing to a Region, Attribute-Based Routing, Directed Diffusion, Rumor Routing, Geographic Hash Tables. Infrastructure Establishment, Topology Control, Clustering, Time Synchronization, Clocks and Communication Delays, Interval Methods, Broadcasts, Localization and Localization Services, Ranging Techniques, Range-Based Localization Algorithms,	10

	Other Localization Algorithms, Location Services. Sensor Tasking and Control, Task-Driven Sensing, Roles of Sensor Nodes and Utilities, Information- Based Sensor Tasking, Sensor selection, IDSQ: Information-driven sensor querying, Cluster leader based protocol, Sensor tasking in tracking relations, Joint Routing and Information Aggregation.	
4	**Security in Ad hoc and Sensor Networks:** Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Antitamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.	10
5	**Platforms and Tools:** Sensor Network Platforms and Tools, Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms, Operating system: Tiny OS, Imperative language: nesC, Dataflow style language: Tiny GALS, Node-Level Simulators, NS-2 and its sensor network extensions, TOSSIM, Programming Beyond Individual Nodes: State-centric programming, Collaboration groups, PIECES: A state-centric design framework, Multi-target tracking problem revisited. Applications and Future Directions.	10

Note 1: Unit 1 & Unit 3   will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes: After the completion of course the students will be able to: **CO1**: Identify different issues in wireless sensor networks and it's applications. **CO2:** Analyze protocols developed for sensor networks. **CO3**: Identify and understand security issues in ad hoc and sensor networks. **CO4**: Analyze the usage of various tools used in networks.

COs	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO7
CO2	PO1,PO2,PO3,PO4,PO5,PO7
CO3	PO4,PO6,PO7,PO9
CO4	PO1,PO2,PO3,PO4,PO5,PO7

TEXT BOOKS:

1. Feng Zhao, Leonidas Guibas: Wireless Sensor Networks – An Information Processing Approach, Elsevier, 2004.
2. Erdal Çayırcı , Chunming Rong: Security in Wireless Ad Hoc and Sensor Networks, John Wiley and Sons, 2009.
3. Cauligi S. Raghavendra, Krishna Sivalingam, Taieb M. Znati, "Wireless Sensor Networks" ,Springer, ISBN: 1-4020-7883-8, August 2005.

REFERENCE BOOKS/WEB LINKS:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, "Ad Hoc Mobile Wireless Networks", Auerbach Publications, 2008.
2. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Inc., 2005.

Sub Title : INFORMATION SYSTEMS		
Sub Code:ISE02	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:
1. Introduce to various types of information systems , issues and concepts related to it.
2. Understand about electronic and enterprise business system management .
3. Familiarize the need and benefits of E-Business, ERP, E-Commence, SCM, DSS.
4. Understand about Security management of IT, Enterprise and Global Management of IT.

Unit No.	Syllabus Content	No of Hours
1	**Foundation concepts – 1:** Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT. System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems **Foundation Concepts – 2:** Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge-creating company.	10
2	**Electronic Business Systems:** Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems. **Enterprise Business Systems:** Customer relationship management: Introduction, What is CRM? Benefits and challenges of CRM, Trends in CRM.	12
3	**Enterprise resource planning:** Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM. **Electronic Commerce Systems:** Electronic commerce fundamentals: Introduction, The scope of e-commerce, Essential e-commerce, processes, and Electronic payment processes. E-commerce application trends, Business-to- Consumer e-commerce, Business-to-Business e-commerce, e-commerce marketplaces	10
4	**Decision Support Systems:** Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management	10

	Information Systems, On-line analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support.	
5	**Decision Support Systems contd:** Knowledge management systems, Business and Artificial Intelligence (AI). **Security management of IT:** Introduction, Tools of security management, Internetworked security defenses, Other security measures, System Controls and audits. **Enterprise and Global Management of IT:** Managing IT: Business and IT, Managing IT, Business / IT planning, Managing the IS function.	**10**

Note 1: Unit 2 & Unit 3   will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
        Assignment – I from Units 1 and 2.
        Assignment – II from Units 3 and 4 .
        Assignment -III from Unit 5

Course Outcomes:
 After completing the course the students are able to:
CO1: Analyze the components, activities and strategies of Information system.
CO2: Apply planning and maintenance strategies to the information systems
CO3: Apply the technologies such as ERP, E-Business and E-Commerce, m-Commerce, wireless networks, mobile computing etc.
CO4: Identify the threats to information security and protect information resources.

COs	Mapping with POs
CO1	PO1,PO2,PO7,PO12
CO2	PO1,PO2,PO3,PO6,PO7,PO9,PO11,PO12
CO3	PO1,PO2,PO3,PO6,PO7,PO9,PO11,PO12
CO4	PO6,PO7,PO9,PO11,PO12

TEXT BOOK:
      James A. O' Brien, George M. Marakas - Management Information Systems -, 7th Edition, Tata McGraw Hill, 2006.

REFERENCE BOOKS/WEB LINKS:
1. Kenneth C. Laudon and Jane P. Laudon -   Management Information System, Managing the Digital Firm -, 9th Edition, Pearson Education, 2006.
2. Steven Alter - Information Systems The Foundation of E-Business , 4th Edition, Pearson Education, 2002.
3. W.S. Jawadekar - Management Information Systems -, Tata McGraw Hill 1998.

Sub Title : PROTOCOL ENGINEERING		
Sub Code:ISE03	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:
1. Introduce concepts about communication protocols. 2. To understand about protocol specification. 3. To introduce students to the concepts of SDL along with testing concepts. 4.

Unit No	Syllabus Content	No of Hours
1	Introduction: Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation, Formal and Informal Protocol Development Methods, Protocol Engineering Phases. Error Control, Flow Control: Type of Transmission Errors, Linear Block Code, Cyclic Redundancy Checks, Introduction to Flow Control, Window Protocols, Sequence Numbers, Negative Acknowledgments, Congestion Avoidance.	12
2	Network Reference Model: Layered Architecture, Network Services and Interfaces, Protocol Functions: Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols.	10
3	Protocol Specification: Components of specification, Service specification, Communication Service Specification Protocol entity specification: Sender, Receiver and Channel specification, Interface specifications, Interactions, Multimedia specifications, Alternating Bit Protocol Specification, RSVP specification.	10
4	Protocol Specification Language (SDL): Salient Features. Communication System Description using SDL, Structure of SDL. Data types and communication paths, Examples of SDL based Protocol Specifications: Question and answer protocol, X-on-X-off protocol, Alternating bit protocol, Sliding window protocol specification, TCP protocol specification, SDL based platform for network, OSPF, BGP Multi Protocol Label Switching SDL components.	10
5	Protocol Verification / Validation: Protocol Verification using FSM, ABP Verification, Protocol Design Errors, Deadlocks, Unspecified Reception, Non-executable Interactions, State Ambiguities, Protocol Validation Approaches: Perturbation Technique, Reachability Analysis, Fair Reachability Graphs, Process Algebra based Validation, SDL Based Protocol Verification: ABP Verification, Liveness Properties, SDL Based Protocol Validation: ABP Validation.	10

	Protocol Conformance and Performance Testing: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation Methods: T, U, D and W methods.	

Note 1: Unit 1 & Unit 5 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes:
 After completing the course the students are able to:

CO1: Analyze the theoretical aspects of communication protocols.
CO2: Apply ideas and techniques discussed to various protocol designs.
CO3: Recognize the different protocol specification and understand about SDL.
CO4: Analyze various testing methodologies.

COs	Mapping with Pos
CO1	PO1,PO3,PO6,PO7,PO12
CO2	PO3,PO5,PO7
CO3	PO1,PO4,PO5,PO7
CO4	PO1,PO9,PO10,PO12

TEXT BOOK:
      Pallapa Venkataram and Sunilkumar S. Manvi: Communication Protocol Engineering, PHI, 2004.

REFERENCE BOOKS/WEB LINKS:
       Mohammed G. Gouda: Elements of Protocol Design, Wiley Student Edition, 2004.

Sub. Title : **MOBILE APPLICATION DEVELOPMENT LAB**		
Sub Code:ISL75	**No. of Credits : 0:0:1.5**	**No. of lecture hours/week : 03**
Exam Duration : 3 hours	**CIE** +Assignment + **SEE = 45 + 5 + 50 =100**	

Course objectives:

1. To understand the Mobile - Android OS architecture and life cycle.
2. To analyze and use appropriate tools for Android Application development.
3. To be familiar with managing of application resources.
4. To build elegant user interfaces with views, layouts& form widgets.
5. To understand the usage of Services and Notifications in Android Apps.

I. LIST OF PROGRAMS

1. Develop an android application that uses GUI components, Font and Colors.
2. Design an android application that uses Layout Managers and event listeners.
3. Develop a native android calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an android application that makes use of database.
6. Implement an android application that implements Multi-threading concept.
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock

II.OPEN ENDED QUESTIONS

Develop an android application using Android Studio/ADT Bundle for any of the following:
1.Mobile Based Attendance System.
2.Android Campus Recruitment System.
3.Android Book Store Project.
4.Student Faculty Document Sharing Android Project
5.Android Based Feedback System.

NOTE :
1. Student is permited to submit open ended solution to any other open ended question apart from the list above . but it has to be approved by the staff in charge.
2. In the examination each student picks one question from a lot of all 10 questions.

Course Outcomes:
After completing the course the students are able to:

CO1: Analyze the fundamentals of Mobile application development.
CO2: Analyze the problems to build Mobile apps by assessing the basic framework and usage of SDK.
CO3: Design and develop Android applications using various resources and built-in classes.
CO4: Develop the skills in designing and deploying the sophisticated mobile applications.
CO5: Design and deploy Android applications with compelling User Interfaces.

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO5
CO2	PO1,PO2,PO4,PO5,PO6
CO3	PO1,PO3,PO4,PO6,PO7
CO4	PO6,PO7,PO9,PO11,PO12
CO5	PO1,PO3,PO4,PO6,PO7

Sub Title : BIG DATA LAB		
Sub Code:ISL76	No of Credits : 0:0:1.5	No. of Lecture Hours/Week : 03
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	

Course Objectives:

1. To understand the concept of Big data with hands on.
2. Understand installation of various Big data tools.
3. To apply Hadoop concepts to various applications and NoSQL implementation.

I. LIST OF PROGRAMS

1. Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system. You will use the hadoop fs command when interacting with HDFS.
   a. Review the commands available for the Hadoop Distributed File System:
   b. Copy file foo.txt from local disk to the user's directory in HDFS
   c. Get a directory listing of the user's home directory in HDFS
   d. Get a directory listing of the HDFS root directory
   e. Display the contents of the HDFS file user/fred/bar.txt

2. Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system. You will use the hadoop fs command when interacting with HDFS.
   a. Move that file to the local disk, named as baz.txt
   b. Create a directory called input under the user's home directory
   c. Delete the directory input old and all its contents
   d. Verify the copy by listing the directory contents in HDFS.

3.MapReduce Programs:
Using movie lens data
   a. List all the movies and the number of ratings
   b. List all the users and the number of ratings they have done for a movie
   c. List all the Movie IDs which have been rated (MovieId with at least one user rating it).

4. Hive Programs:
Hive allows for the manipulation of data in HDFS using a variant of SQL. This makes it excellent for transforming and consolidating data for load into a relational database. In this exercise you will use HiveQL to filter and aggregate click data to build facts about user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database.
The moveapp_log_json table contains an activity column. Activity states may be as follows:

- RATE_MOVIE
- COMPLETED_MOVIE
- PAUSE_MOVIE
- START_MOVIE
- BROWSE_MOVIE
- LIST_MOVIE
- SEARCH_MOVIE
- LOGIN
- LOGOUT
- INCOMPLETE_MOVIE.

Hive maps queries into Map Reduce jobs, simplifying the process of querying large datasets in HDFS. HiveQL statements can be mapped to phases of the Map Reduce framework. Selection and transformation operations occur in map tasks, while aggregation is handled by reducers. Join operations are flexible: they can be performed in the reducer or mappers depending on the size of the leftmost table. Write query to:

a. Create the database "movieworks" and it's corresponding table.
b. Write a query to insert movie details into the query.
c. Load the table with the data.
d. Create an external table(example: movieapp_log). An external table is created for the conversion text file to binary file which can then be sent to HSFS through the operating system. Avro system is usedfor conversion of text file to binary file
e. Insert the details of internally created table(movie_details1) using insert overwrite command to the external table (loading the external table with the data).

5. R-PROGRAMMING:

Write R program to:
a. Create two matrices and perform multiplication & division on those matrices.
b. Create a data frame and print the: data frame, structure of data frame and summary of data frame.
c. Create a Bar chart and sketch the Bar chart by taking months as input & plot it against revenue. Also, add legend to the chart that includes regions.

II. OPEN ENDED QUESTIONS

1. Word count using MapReduce.
2. Execute basic PIG commands.

NOTE:

1.STUDENT IS PERMITED TO SUBMIT OPEN ENDED SOLUTION TO ANY OTHER OPEN ENDED QUESTION APART FROM THE LIST ABOVE . BUT IT HAS TO BE APPROVED BY THE STAFF IN CHARGE.

2. STUDENT IS REQUIRED TO EXECUTE ONE QUESTION FROM A LOT OF ALL 5 QUESTIONS.
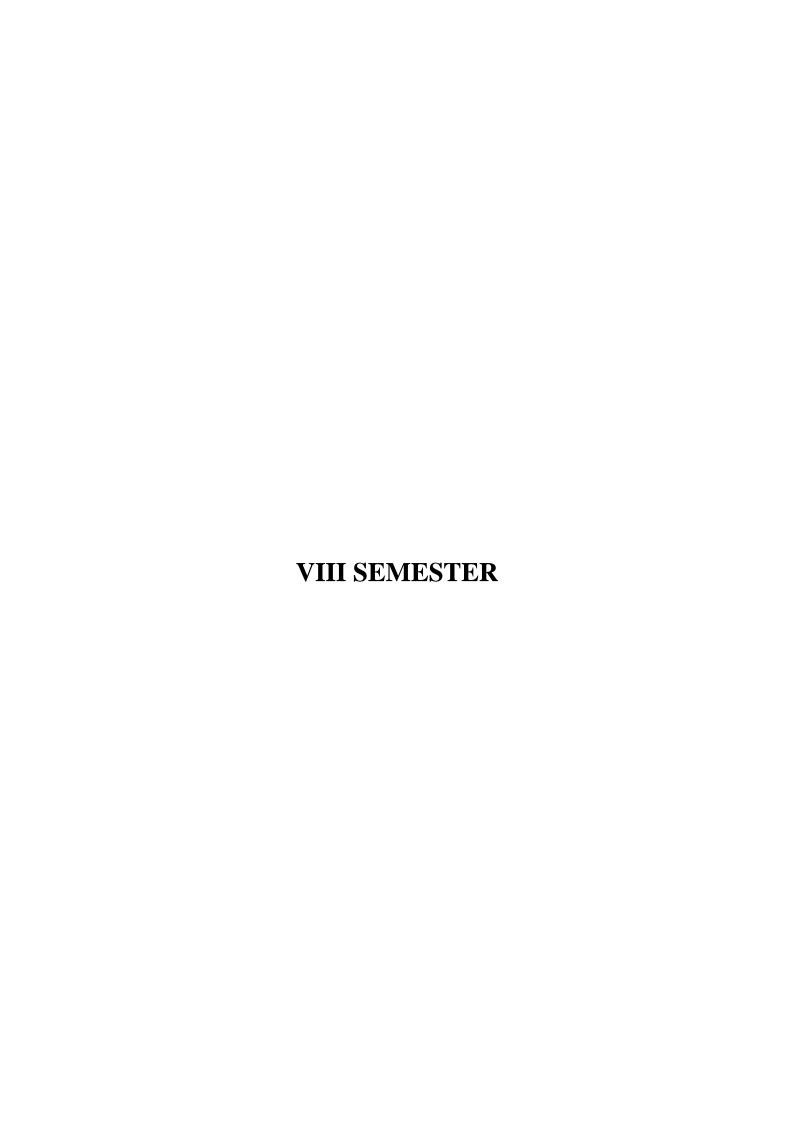
Course Outcomes:

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

CO1: Elucidate installation of various Big data tools.

CO2: Implement HiveQL statements.

CO3: Differentiate between SQL and NoSQL commands.

COs	Mapping with POs
CO1	PO2,PO5,PO7,PO11
CO2	PO5, PO7,PO12
CO3	PO7,PO9,PO10,PO12

Sub Title : PROJECT PHASE -I		
Sub Code:ISP77	No. of Credits: No Credits (L-T-P)	

VIII SEMESTER

Sub Title : INTELLECTUAL PROPERTY RIGHTS		
Sub Code: HS04	No. of Credits: 2= 2 : 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 2 hours	Exam Marks : CIE + Assignment + SEE= 45+5+50 =100	Total No. of Contact Hours : 26

Course Objectives:
1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

Unit No	Syllabus Content	Hours
1	**INTRODUCTION**: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Provision of IPR under TRIPS and WTO. Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	03
2	**PATENT RIGHTS AND COPY RIGHTS**— Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties. **COPY RIGHT**—Origin, Definition &Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Infringement, Remedies, Copy rights with special reference to software.	10
3	**TRADE MARKS**— Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties.	04
4	**DESIGN-** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention of design- types and functions. Semiconductor Integrated circuits and layout design Act-2000.	05
5	**BASIC TENENTS OF INFORMATION TECHNOLOGY ACT-2000-** Cyber crimes, digital signature and E-Commerce.	04

Note: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes:

CO1: The students once they complete their academic projects, they get   awareness of acquiring the patent.

CO2: They also learn to have copyright for their innovative works.

CO3: They also get the knowledge of plagiarism in their innovations which can be questioned legally.

COs	Mapping with POs
CO1	PO6
CO2	PO6
CO3	PO6

TEXT BOOKS:

1. Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy
2. Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.WadehraIPR by P. Narayanan
4. Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni.

Sub Title : SOFTWARE TESTING		
Sub Code:IS81	**No. of Credits:4=4 : 0 : 0 (L-T-P)**	**No.of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks:CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives:
1. Discuss about terminologies of software testing .
2. Familiarize with strengths and weaknesses of a variety of test generation.
3. Analyze different types of software testing.
4. Infer functional and non functional testing.
5. Integrating the applications of Test management and automation in software testing .

Unit No	Syllabus Content	No of Hours
1	**Basics of Software Testing:** Human Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness versus Reliability, Testing and Debugging, Test Metrics, Software and Hardware Testing, Testing and Verification, Defect Management, Execution History, Test-generation Strategies, Static Testing, Model-Based Testing and Model Checking, Control-Flow Graph.	12
2	**Test Generation from Requirements:** Introduction, The Test-Selection Problem, Equivalence Partitioning, Boundary Value Analysis, Category-Partition Method, Cause-Effect Graphing,	10
3	**Types of Testing – 1:** White Box Testing, Introduction, Static Testing, Structural Testing, Challenges in Whit box testing, Black Box Testing: Introduction, Testing methods. Integration Testing: Introduction, Integration testing as a Type of Testing, Integration testing as a Phase of Testing, Scenario Testing, Defect Bash.	10
4	**Types of Testing – 2:** System and Acceptance Testing, Overview, Functional System Testing, Non-functional Testing, Acceptance Testing; Summary of Testing Phases, Regression Testing: Introduction, Methodologies, Best Practices.	10
5	**Test Management and automation:** Introduction, Test planning, Test management, Test process, Test reporting, Test planning checklists, Test plan template. What is Test automation? Terms used in Automation, Skills needed for Automation ,what to automate, scope of automation, design and architecture for automation.	10

Note 1: Unit 1 & Unit 5 will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:

   Assignment – I from Units 1 and 2.

   Assignment – II from Units 3 and 4 .

   Assignment -III from Unit 5

Course Outcomes:

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

CO1: Apply terms associated with software testing.

CO2: Design various test generation strategies.

CO3: Implement different types of software testing in application development.

CO4: Summarize aspects of functional and non functional testing.

CO5: Apply the usage of test Management and automation in software testing.

COs	Mapping with Pos
CO1	PO1,PO2,PO7,PO12
CO2	PO1,PO2,PO3,PO5,PO7
CO3	PO1,PO2,PO3,PO5,PO7,PO9,PO10
CO4	PO1,PO2,PO3,PO4,PO5,PO7
CO5	PO5,PO7,PO8,PO9,P10,PO11,PO12

TEXT BOOKS:

1. Aditya P Mathur, Foundations of Software Testing, Pearson Education, First Edition, 2010.ISBN-9788131707951
2. Srinivasan Desikan, Gopalaswamy Ramesh, Software Testing - Principles and Practices, Pearson Education, First Edition, 2010. ISBN-978-8-177-58121-8

REFERENCE BOOKS/WEBLINKS:

Ron Patton, Software Testing, Pearson Education, Second Edition, 2010.
ISBN-978-81-7758-030

Sub Title : WIRELESS SENSOR NETWORKS		
Sub Code:IS821	No. of Credits:4=4: 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks: CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours :52

Course Objectives:
1. To learn about the issues in the design of wireless networks.
2. To understand the protocols used in sensor networks.
3. To expose students to different aspects in sensor networks.
4. To understand various security issues in ad hoc and sensor networks along with their issues.

Unit No	Syllabus Content	No of Hours
1	**Introduction:** Unique Constraints and Challenges, Advantages of Sensor Networks, Energy advantage, Detection advantage, Sensor Network Applications, Habitat monitoring, Wildlife conservation through autonomous, non-intrusive sensing, Tracking chemical plumes, Ad hoc, just-in-time deployment mitigating disasters, Smart transportation: networked sensors making roads safer and less congested, Collaborative Processing. **Key Definitions and The Problem:** Key Definitions of Sensor Networks, Canonical Problem: Localization and Tracking, Tracking Scenario, Problem Formulation.	12
2	**Key Definitions and The Problem contd:** Sensing model, Collaborative localization, Bayesian state estimation, Distributed Representation and Inference of States, Impact of choice of representation, Design desiderata in distributed tracking, Tracking Multiple Objects, State space decomposition, Data association, Sensor Models, Performance Comparison and Metrics. **Networking and Protocols:** Networking Sensors, Key Assumptions, Medium Access Control, The SMAC Protocol, IEEE 802.15.4 Standard and ZigBee.	10
3	**Networking and Protocols cont..:** General Issues, Geographic, Energy-Aware Routing, Unicast Geographic Routing, Routing on a Curve, Energy-Minimizing Broadcast, Energy- Aware Routing to a Region, Attribute-Based Routing, Directed Diffusion, Rumor Routing, Geographic Hash Tables. Infrastructure Establishment, Topology Control, Clustering, Time Synchronization, Clocks and Communication Delays, Interval Methods, Broadcasts, Localization and Localization Services, Ranging Techniques, Range-Based Localization Algorithms, Other Localization Algorithms, Location Services. Sensor Tasking and Control, Task-Driven Sensing, Roles of Sensor Nodes and Utilities, Information- Based Sensor Tasking, Sensor selection, IDSQ: Information-driven sensor querying, Cluster leader based protocol, Sensor tasking in tracking relations, Joint Routing and Information Aggregation.	10
4	**Security in Ad hoc and Sensor Networks:** Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Antitamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.	10
5	**Platforms and Tools:** Sensor Network Platforms and Tools, Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-	10

	Level Software Platforms, Operating system: Tiny OS, Imperative language: nesC, Dataflow style language: Tiny GALS, Node-Level Simulators, NS-2 and its sensor network extensions, TOSSIM, Programming Beyond Individual Nodes: State-centric programming, Collaboration groups, PIECES: A state-centric design framework, Multi-target tracking problem revisited. Applications and Future Directions.	

Note 1: Unit 1 & Unit 3 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
> **Assignment – I from Units 1 and 2.**
> **Assignment – II from Units 3 and 4 .**
> **Assignment -III from Unit 5**

Course Outcomes:

After the completion of course, the students will be able to:
CO1: Identify different issues in wireless sensor networks and it's applications.
CO2: Analyze protocols developed for sensor networks.
CO3: Identify and understand security issues in ad hoc and sensor networks.
CO4: Analyze the usage of various tools used in networks.

COs	Mapping with Pos
CO1	PO1,PO2,PO3,PO4,PO5,PO7,PO12
CO2	PO1,PO2,PO3,PO4,PO5,PO7
CO3	PO4,PO6,PO7,PO9,PO12
CO4	PO1,PO2,PO3,PO4,PO5,PO7,PO8
CO5	PO1,PO2,PO3,PO4,PO12

TEXT BOOKS:
1. Feng Zhao, Leonidas Guibas: Wireless Sensor Networks – An Information Processing Approach, Elsevier, 2004.
2. Erdal Çayırcı , Chunming Rong: Security in Wireless Ad Hoc and Sensor Networks, John Wiley and Sons, 2009.
3. Cauligi S. Raghavendra, Krishna Sivalingam, Taieb M. Znati, "Wireless Sensor Networks" ,Springer, ISBN: 1-4020-7883-8, August 2005.

REFERENCE BOOKS/WEBLINKS:
1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, "Ad Hoc Mobile Wireless Networks", Auerbach Publications, 2008.
2. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Inc., 2005.

Sub Title : PROTOCOL ENGINEERING		
Sub Code:IS822	No. of Credits:4=4: 0 : 0 (L-T-P)	No. of Lecture Hours/Week : 4
Exam Duration : 3 hours	Exam Marks:CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours :52

Course Objectives:
      1. Introduce concepts about communication protocols.
      2. To understand about protocol specification.
      3.To introduce students to the concepts of SDL along with testing concepts.

Unit No	Syllabus Content	No of Hours
1	**Introduction:**Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation, Formal and Informal Protocol Development Methods, Protocol Engineering Phases. Error Control, Flow Control: Type of Transmission Errors, Linear Block Code, Cyclic Redundancy Checks, Introduction to Flow Control, Window Protocols, Sequence Numbers, Negative Acknowledgments, Congestion Avoidance.	12
2	**Network Reference Model**: Layered Architecture, Network Services and Interfaces, Protocol Functions: Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols.	10
3	**Protocol Specification:** Components of specification, Service specification, Communication Service Specification Protocol entity specification: Sender, Receiver and Channel specification, Interface specifications, Interactions, Multimedia specifications, Alternating Bit Protocol Specification, RSVP specification.	10
4	**Protocol Specification Language (SDL):** Salient Features. Communication System Description using SDL, Structure of SDL. Data types and communication paths, Examples of SDL based Protocol Specifications: Question and answer protocol, X-on-X-off protocol, Alternating bit protocol, Sliding window protocol specification, TCP protocol specification, SDL based platform for network, OSPF, BGP Multi Protocol Label Switching SDL components.	10
5	**Protocol Verification / Validation:** Protocol Verification using FSM, ABP Verification, Protocol Design Errors, Deadlocks, Unspecified Reception, Non-executable Interactions, State Ambiguities, Protocol Validation Approaches: Perturbation Technique, Reachability Analysis, Fair Reachability Graphs, Process Algebra based Validation, SDL Based Protocol Verification: ABP Verification, Liveness Properties, SDL Based Protocol Validation: ABP Validation. Protocol Conformance and Performance Testing: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation Methods: T, U, D and W methods.	10

Note 1: Unit 1 & Unit 5 will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes:

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

CO1: Analyze concrete view on the theoretical aspects of communication protocols.

CO2: Apply ideas and techniques to various protocol designs.

CO3: Recognize the different protocol specification about SDL.

CO4 : Analyze various testing methodologies.

COs	Mapping with Pos
CO1	PO1,PO3,PO6,PO7,PO12
CO2	PO3,PO5,PO7
CO3	PO1,PO4,PO5,PO7
CO4	PO1,PO9,PO10,PO12

TEXT BOOK:
      Pallapa Venkataram and Sunilkumar S. Manvi: Communication Protocol Engineering, PHI, 2004.

REFERENCE BOOKS/WEBLINKS:
      Mohammed G. Gouda: Elements of Protocol Design, Wiley Student Edition, 2004.

Sub. Title : MACHINE LEARNING and APPLICATIONS		
Sub. Code : IS823	**No. of Credits:4=4: 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives:

1. To understand the basic concepts of machine learning along with decision trees.
2. To comprehend about neural networks and genetic algorithms
3. To obtain knowledge about various applications of machine learning.

Unit No.	Syllabus Content	No. of Hours
1	**Introduction and Machine Learning Basics**: **Introduction:** A brief overview of machine learning, Machine learning: what and why? , Key tasks in machine learning, Why you need to learn about machine learning, Steps in developing a machine learning application; Supervised learning; Unsupervised learning; Some basic concepts in machine learning. **Machine learning basics:** Classifying with k-Nearest Neighbors (kNN), Example: Using kNN on handwriting recognition system; Examples of Machine Learning Applications, An Overview: Learning Associations, Classification, Regression, Reinforcement Learning; Concept Learning.	11
2	**Decision trees:** Learning Problems, Designing Learning systems, Perspectives and Issues, Concept Learning Tasks, Version Spaces and Candidate Elimination Algorithm, Decision Tree Representation – Basic Decision Tree Learning Algorithm – Heuristic Space Search.	10
3	**Neural Networks and Genetic Algorithms:** Neural Network Representation, Problems, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Genetic Algorithms.	10
4	Naive Bayes Classifier, Bayesian belief networks, EM algorithm, Evaluating Hypothesis-Motivation, Basics of Sampling theorem, Comparing learning algorithms, Instance based learning.	10
5	**Applications:** Social Network Analysis- Social Sciences and Bibliometry – Evaluation of Topic Distillation- Measuring and Modeling the Web – Resource Discovery –Topical Locality and Focused Crawling – Discovering Communities- The Future of Web Mining; Machine learning in MapReduce; Machine Learning Applications to Internet of Things (IoT); Machine Learning for: Big Data, Smart Computing Environmental applications and others.	11

Note 1: Unit 1 & Unit 5 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
     Assignment – I from Units 1 and 2.
     Assignment – II from Units 3 and 4 .
     Assignment -III from Unit 5

Course Outcomes:

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

CO1: Explicate the learning techniques along with basic knowledge on machine learning.
CO2: Acquire knowledge on decision tree learning.
CO3: Apply and comprehend neural network and genetic algorithms techniques.
CO4: Attain knowledge about classifier and algorithms.
CO5: Elucidate various machine learning applications.

COs	Mapping with POs
CO1	PO1,PO2
CO2	PO2,PO12
CO3	PO3,PO4,PO5
CO4	PO2,PO3,PO4,PO5
CO5	PO3,PO4,PO5,PO12

TEXT BOOKS:
1. Kevin P. Murphy, "Machine Learning A Probabilistic Perspective", The MIT Press, 2012.
2. Peter Harrington , "Machine Learning in Action", MANNING Shelter Island Publication, ISBN 9781617290183, 2012.
3. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education , 2013.

REFERENCE BOOKS/ WEBSITES:
1. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.
3. http://www.cs.wustl.edu/~jain/cse570-15/ftp/iot_ml/

Sub Title : : INTERNET PROGRAMMING		
Sub Code:ISE04	**No. of Credits:4=4: 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks: CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives:
1. To create a web page using XHTML
2. To understand Cascading Style Sheets
3. To do data validation and user interaction using JavaScript

Unit No..	Syllabus Content	No of Hours
1	**Fundamentals of web, XHTML – 1:** Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; The Web Programmers Toolbox. XHTML-1 : Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup. **XHTML – 2:** Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML.	12
2	**CSS:** Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images	9
3	**Javascript:** Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions	11
4	**Javascript and HTML documents:**The Javascript execution environment; The Document Object Model; Element access in Javascript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model	10
5	**Dynamic documents with javascript:** Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements; Dragging and dropping elements	10

Note 1: Unit 1 & Unit 3 will have internal choice.
Note 2: Three Assignments are evaluated for 5 marks:
      Assignment – I from Units 1 and 2.
      Assignment – II from Units 3 and 4 .
      Assignment -III from Unit 5

Course Outcomes:

After the completion of the above course students will be able to

CO1: Identify and relate the different terms associated with web technologies.
CO2: Design simple web pages using different tags of XHTML.
CO3: Classify and use different levels of style sheets.
CO4: Validate and provide user functionality using JavaScript (client side data).
CO5: Access the different elements using JavaScript and make use pattern matching concepts

COs	Mapping with POs
CO1	PO2,PO3,PO5
CO2	PO1,PO2,PO3,PO6,PO7,PO9
CO3	PO2,PO3,PO5,PO6
CO4	PO2,PO3,PO5,PO6,PO9
CO5	PO2,PO3,PO5,PO6

TEXT BOOK:

Robert W. Sebesta: Programming the World Wide Web, 6th Edition, Pearson education, 2010

REFERENCE BOOKS / WEBLINKS:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 5th Edition, Pearson education, 2012.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.
3. www.w3schools.com

Sub Title :ARTIFICIAL INTELLIGENCE		
Sub Code:ISE05	**No. of Credits:4=4: 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks:CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives:
1. Understand about agent, behavior and structure
2. Learn different search strategies
3. Representation of knowledge and reasoning
4. Gain knowledge about planning and learning strategies

Unit No	Syllabus Content	No of Hours
1	**Intelligent agents:** Agents and environments, good behavior, concept of rationality, nature of environments, structure of agents	10
2	**Problem-solving through Search:** Problem solving agents, searching for solutions, uninformed search strategies, A*, minimax	11
3	**Knowledge Representation and Reasoning:** ontologies, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, syntax and semantics of first order logic, Propositional vs. Fist order inference, Forward chaining and backward chaining.	10
4	**Planning:** planning as search, partial order planning, construction and use of planning graphs	11
5	**Machine Learning and Knowledge Acquisition:** forms of learning, inductive learning, learning decision trees, Learning nearest neighbor, Reinforcement learning, passive and active RL.	10

Note 1: Unit 2 & Unit 4 will have internal choice.

Note 2: Three Assignments are evaluated for 5 marks:

   Assignment – I from Units 1 and 2.

   Assignment – II from Units 3 and 4 .

   Assignment -III from Unit 5

Course Outcomes:

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

CO1:Analyze agent and environment.

CO2: Apply different Search strategies in problem solving .

CO3: Represent knowledge and perform   reasoning.

CO4: Apply Planning strategies and machine learning techniques.

COs	Mapping with POs
CO1	PO1,PO12
CO2	PO7,PO12
CO3	PO1,PO2
CO4	PO5,PO7,PO12

TEXT BOOKS:

 Artificial Intelligence: A Modern Approach, 3rd Edition, by Stuart Russell and Peter Norvig.
(2.1,2.2,2.3,2.4,3.1,3.3,3.4,4.1,4.2,6.2,8.1,8.2,9.1,9.3,9.4,10.1,10.2,10.3,10.4,11.2,11.3,11.4,18.1,18.2,18.3,19.3,20.4,21.1,21.2,21.3)

REFERENCE BOOKS/WEBLINKS:

1. Luger, G. F., & Stubblefield, W. A., Artificial Intelligence - Structures and Strategies for Complex Problem Solving. New York, NY: Addison Wesley, 5th edition (2005).
2. Nilsson, N. J. Artificial Intelligence - A Modern Synthesis. Palo Alto: Morgan Kaufmann. (1998).
3. Nilsson, N. J., Principles of Artificial Intelligence. Palo Alto, CA: Tioga (1981).
4. Rich, E., & Knight, K., Artificial Intelligence. New York: McGraw-Hill (1991).

Sub Title : JAVA PROGRAMMING		
Sub Code:ISE06	No. of Credits:4=4 : 0 : 0 (L-T-P)	No. of lecture hours/week : 4
Exam Duration : 3 hours	Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100	Total No. of Contact Hours : 52

Course Objectives:

1. To understand Object oriented concepts like data abstraction, encapsulation, etc.
2. To solve the real world scenarios using top down approach.
3. To understand various Java programming constructs.
4. Create animation & events based upon advanced java concepts.

UNIT No	Syllabus Content	No of Hours
1	**Introduction to Java**: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs. Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers. Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The.? Operator; Operator Precedence; Logical expression; Type casting; Strings Control Statements: Selection statements, iteration statements, Jump Statements.	12
2	**Classes, Inheritance:**Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes. Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.	10
3	**Exception handling:**Exception handling in Java. The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.	10
4	**Multi Threaded Programming,:**Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems	10
5	**Event Handling:**Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes. **Swings:** Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon;	10

	JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.	

Note 1:Unit 1 and Unit 5 will have internal choice.

Note 2:Three Assignments are evaluated for 5 marks:
  Assignment – I from Units 1 and 2.
  Assignment – II from Units 3and 4.
  Assignment -III from Unit 5

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

CO1: Solve computational problems using basic constructs like if-else, control structures, array, strings and write java programs .
CO2: Model real world scenario using class diagram.
CO3: Demonstrate communication between 2 objects using sequence diagram. Implement relationships between classes.
CO4: Design and develop programs on exceptions, multithreading and applets, database applications.

COs	Mapping with POs
CO1	PO1,PO2,PO5,PO6,PO10
CO2	PO3,PO4,PO5,PO7
CO3	PO1,PO5,PO7
CO4	PO1,PO2,PO5,PO7

TEXT BOOK:
  1. Herbert Schildt: Java - The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
     (Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
  2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
     (Chapters 5, 6, 11, 12, 15)

REFERENCE BOOKS/WEBLINKS:

  1. Y. Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson Education, 2007.
  2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson

Sub Title : SEMINAR		
Sub Code:ISS84	No. of Credits:2	
	CIE + SEE = 50 + 50 =100	