

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

VISION AND MISSION OF THE INSTITUTE

VISION

The Institute strives to inculcate a sound knowledge in engineering along with realized social responsibilities to enable its students to combat the current and impending challenges faced by our country and to extend their expertise to the global arena.

MISSION

The mission of the Institute is to impart high quality education and training to its students to make them World-Class Engineers with a foresight to the changes and problems, and pioneers to offer innovative solutions to benefit the nation and the world at large.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING & INFORMATION TECHNOLOGY

VISION AND MISSION

VISION

To evolve as a Centre of Excellence for research and learning, integrating Computing and Information Sciences with Natural Sciences and Basic Engineering to develop products and services for the benefit of Industries and Society at large.

MISSION

- To enable the graduates to adapt to the rapidly changing technology with the help of sound fundamentals.
- To impart value based technical education and entrepreneurial skills to the graduates with state-of-the-art infrastructure and innovative faculty.
- To promote collaborative learning and research with industry, government and International organizations for continuous knowledge transfer and enhancement.
- To educate students, to design and develop intelligent products and services meeting global demands and standards.
- To develop globally competent engineers capable of providing secure and Out-of-the Box computing and information technology solutions.

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING &
INFORMATION TECHNOLOGY**

B.E. COMPUTER SCIENCE AND ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The following Programme Educational Objectives are designed based on the Department Mission.

1. To provide the students with core competence in Mathematics, Science and Basic engineering fundamentals for formulating, analyzing and solving engineering and business problems.
2. To impart the students with good breadth and depth of knowledge in Computer Science Engineering and related technologies with a orientation to create innovative products and solutions to the real life problems.
3. To equip the students with good ethical standards, professional attitude and effective communication skills and ability to work in multi-disciplinary teams and multinational groups in meeting the broader societal needs.
4. To inculcate in students, a desire for lifelong learning and motivation for research and development and ability to adapt to changes in technology.

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING &
INFORMATION TECHNOLOGY**

B.E. COMPUTER SCIENCE AND ENGINEERING

PROGRAMME OUTCOMES (POs)

At the end of the graduation, students in the Computer Science and Engineering programme should possess:

- a. Basic fundamental knowledge in mathematical problem solving, general engineering, electrical sciences and in depth knowledge in computer science and engineering.
- b. Ability to identify, analyze, design real life and business problems using suitable algorithms of varying complexity.
- c. Ability to produce cost effective, high quality and maintainable software products and solutions (services) for meeting the global requirements by deploying the emerging techniques, tools and software engineering methodologies and principles.
- d. Apply mathematical modeling to solve computational problems in wired, wireless and mobile communication networks and ability to adapt change in technologies. **(PSPO1)**
- e. An ability to understand the capability of a Business Process where information is available across an organization as a whole, extracting facts from "multiple versions of the truth" and build business models, marketing and product strategies.
- f. Basic knowledge in soft computing and hard computing techniques and methods used to design and development of R&D problems for lifelong learning.
- g. Ability to work in team by utilizing modern engineering software tools and emerging technologies to develop products for the societal needs and ability to comprehend and write reports and communicate effectively.
- h. Make the students 'green conscious' and to give them a better understanding of the concept of environment, the causes that lead to deterioration, and the measures that need to be taken for nurturing it for future generations and optimize resource utilization.
- i. To inculcate among the students the importance of spirituality and yoga - the path which provides ability to face failures and bounce back and to understand others point of view.
- j. Know the basics of business and management, project management, the basis of micro- and macroeconomics, marketing and promotion, organizational changing and development, financing, IT and communications and understand their interaction.
- k. To obtain sound knowledge base and skill sets to develop and expand professional careers in fields related to human-computer interaction, computerized control systems, Instrumentation and management of industrial processes for the design and implementation of intelligent system. **(PSPO2)**

- l. Ability to do hardware and software co-design and develop skills in analysis, optimization and implementation of real time systems. **(PSPO3)**
- m. Ability to enable efficient organization of data storage that facilitates information retrieval for analytic purpose, pattern discovery and identifying relationships using statistical algorithms. **(PSPO4)**
- n. Ability to design, implement and manage secure networking solutions using the emerging technologies and the state-of-the-art network appliances in accordance with international standards and laws. **(PSPO5)**
- o. To help the students evolve as a human being, to become aware of one's limitations; to strive, transcend and move towards an experiential reality where one knows the ultimate nature of the existence, the way it is made.

COIMBATORE INSTITUTE OF TECHNOLOGY

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B.E. COMPUTER SCIENCE AND ENGINEERING

Curriculum from the Academic Year 2013 - 2014 onwards

SUBJECTS OF STUDY

Semester III

Code No.	Course Title	L	T	P	C
THEORY					
13CS31	Linear Algebra, Fourier Transforms and Partial Differential Equations	3	1	0	4
13CS32	Automata Theory and Discrete Mathematics	3	1	0	4
13CS33	Data Structures and Algorithms - I	3	1	0	4
13CS34	Electrical Machines and Circuit Theory	3	0	0	3
13CS35	Computer Architecture	3	1	0	4
13CS36	Object Oriented Programming and Java	3	0	0	3
PRACTICALS					
13CS47	Electrical and Electronics Laboratory	0	0	3	-
13CS48	Data Structures and Algorithms, OOP and Automata Laboratory	0	0	3	-
13CE49	Science of Creativity and Professional Ethics	2	0	0	-
Total Credits					22

Semester IV

Code No.	Course Title	L	T	P	C
THEORY					
13CS41	Numerical Methods, Statistics and Random Processes	3	1	0	4
13CS42	Engineering Mechanics and Strength of Materials	3	1	0	4
13CS43	Data Structures and Algorithms - II	3	1	0	4
13CS44	Electronic Circuits	3	0	0	3
13CS45	Analog and Digital Communication	3	0	0	3
13CS46	Software Engineering	3	0	0	3
PRACTICALS					
13CS47	Electrical and Electronics Laboratory	0	0	3	4
13CS48	Data Structures and Algorithms, OOP and Automata Laboratory	0	0	3	4
13CE49	Science of Creativity and Professional Ethics	2	0	0	2
Total Credits					31

Semester V

Code No.	Course Title	L	T	P	C
THEORY					
13CS51	Operating Systems	3	0	0	3
13CS52	Resource Management Techniques	3	1	0	4
13CS53	Computer Networks	3	0	0	3
13CS54	Microprocessors and Interfacing	3	0	0	3
13CS55	Graphics and Multimedia	3	0	0	3
13CS56	Database Management Systems	3	1	0	4
PRACTICALS					
13CS67	Microprocessor and Embedded Systems Laboratory	0	0	3	-
13CS68	Data Retrieval & Analysis and Software Engineering Laboratory	0	0	3	-
13CS69	Mini Project	0	0	3	-
Total Credits					20

Semester VI

Code No.	Course Title	L	T	P	C
THEORY					
13CS61	Cryptography and Network Security	3	0	0	3
13CS62	Intelligent Agents	3	0	0	3
13CS63	Data Warehousing and Data Mining	3	0	0	3
13CS64	UNIX Internals	3	0	0	3
13CS65	Embedded and Real Time Systems	3	0	0	3
13CS66	Distributed Systems	3	0	0	3
PRACTICALS					
13CS67	Microprocessor and Embedded Systems Laboratory	0	0	3	4
13CS68	Data Retrieval & Analysis and Software Engineering Laboratory	0	0	3	4
13CS69	Mini Project	0	0	3	2
Total Credits					28

Semester VII

Code No.	Course Title	L	T	P	C
THEORY					
13CS71	Introduction to Compiler Design	3	1	0	4
13CS72	Web Technology	3	1	0	4
13CS73	Open Source Systems	2	0	3	4
13CS74	Elective - I	3	0	0	3
13CS75	Elective - II	3	0	0	3
PRACTICALS					
13CS86	Web Programming and Compiler Laboratory	0	0	3	-
13CS87	Distributed Component and Networks Laboratory	0	0	3	-
13CS88	Project and Viva - Voce	0	0	6	-
Total Credits					18

Semester VIII

Code No.	Course Title	L	T	P	C
THEORY					
13CS81	Industrial Economics and Corporate Management	3	0	0	3
13CS82	Virtualization Techniques	3	0	0	3
13CS83	Ad-hoc and Sensor Networks	3	0	0	3
13CS84	Elective - III	3	0	0	3
13CS85	Elective - IV	3	0	0	3
PRACTICALS					
13CS86	Web Programming and Compiler Laboratory	0	0	3	4
13CS87	Distributed Component and Networks Laboratory	0	0	3	4
13CS88	Project and Viva - Voce	0	0	6	6
Total Credits					29

LIST OF ELECTIVES

Code No.	Course Title	L	T	P	C
E-1	Automotive Electronics - Embedded Software Developer	3	0	0	3
E-2	Cloud Computing	3	0	0	3
E-3	Customer Relationship Management	3	0	0	3
E-4	Enterprise Resource Planning	3	0	0	3
E-5	Grid Computing	3	0	0	3
E-6	High Speed Networks	3	0	0	3
E-7	Human Computer Interface and Usability Engineering	3	0	0	3
E-8	Information Security	3	0	0	3
E-9	Information Storage and Management	3	0	0	3
E-10	Machine Learning	3	0	0	3
E-11	Mobile Computing	3	0	0	3
E-12	Robotics	3	0	0	3
E-13	Service Oriented Architecture and Web Services	3	0	0	3
E-14	Semantic Web	3	0	0	3
E-15	Soft Computing	3	0	0	3
E-16	Software Agents	3	0	0	3
E-17	Speech and Language Processing	3	0	0	3
E-18	User Interface Design	3	0	0	3
E-19	VLSI Design	3	0	0	3
E-20	Bioinformatics	3	0	0	3
E-21	Digital Image Processing	3	0	0	3
E-22	Digital Signal Processing	3	0	0	3
E-23	Software Testing and Quality Assurance	3	0	0	3
E-24	Supply Chain Management	3	0	0	3

L - Lecture, T - Tutorial, P - Practical, C- Credit

13CS31 - LINEAR ALGEBRA, FOURIER TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To incorporate the ideas of Linear algebra those are imperative for the Effective understanding of Computer Science and Engineering. To enrich the concepts of partial differential equations, Fourier transforms and boundary value problems those are vital for the study of engineering disciplines.

COURSE OUTCOMES

- CO1** : *Apply Linear algebra concepts to understand and solve computer science problems.*
- CO2** : *Apply Partial differential equations ideas in modeling and solving Engineering problems.*
- CO3** : *Ability to acquire knowledge in Fourier transforms ideas to analyze and study their areas.*
- CO4** : *To solve problems related with the above mentioned areas and can identify the areas in their disciplines wherein these ideas could be directly applied.*

LINEAR ALGEBRA-I

System of Linear equations - Solution of linear system -Linear transformations - Matrix of linear transformation - Matrix operations - Inverse of a matrix - Matrix factorizations - Subspaces of \mathbb{R}^n - Dimension and Rank - Determinants - Cramer's rule - Matrix factorization - Cholesky decomposition - QR factorization - Singular value decomposition - Toeplitz matrices and some applications. **(9)**

LINEAR ALGEBRA-II

Vector spaces and subspaces - Null spaces and column spaces - Linearly independent sets - Basis - Coordinate systems - Dimension of a vector space - Rank - Eigenvector and Eigenvalues-Characteristic equation- Diagonalization - Eigenvectors and linear transformations - Orthogonal sets - Gram Schmidt process - Least square problems - Inner products space. **(9)**

PARTIAL DIFFERENTIAL EQUATIONS

Formation by elimination of arbitrary constants and functions - solution by direct method-solution of first order non-linear PDE-standard types-Lagrange's linear equation-Linear higher order homogeneous PDE with constant coefficients. **(9)**

FOURIER TRANSFORMS

Fourier integral theorem (without proof) - Infinite Fourier transform - infinite Fourier sine and cosine transforms - properties and problems - Convolution theorem - Parseval's identity - Finite Fourier sine and cosine Transforms - properties and problems. **(9)**

BOUNDARY VALUE PROBLEMS

Vibration of strings-one dimensional wave equations, one dimensional heat flow- unsteady state and steady state -Two dimensional heat flow steady state in Cartesian coordinates-Separation of variables-Fourier series solution.

(9)

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Kandasamy, P.et al., "Engineering Mathematics", Volume - III S.Chand &Co. 2013 Revised edition
2. Veerarajan.T, "Transforms and Partial Differential Equations First edition McGraw Hill Education India Pvt Ltd, New Delhi,2011
3. Venkataraman.M.K., "Engineering Mathematics III", for B.E., Third Semester, Revised and Enlarged Fourteenth Edition, The National Publishing Company, 2008.
4. Venkataraman.M.K., "Engineering Mathematics III-A", Eleventh Edition, The National Publishing Company, 2008.
5. David C Lay, "Linear Algebra and Its Applications", Pearson Education Asia, New Delhi, 2003.
6. Gilbert Strang, Linear Algebra and Its Applications," Brooke/Cole Ltd., New Delhi, Fourth Revised Edition, 2012.

REFERENCE BOOKS

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons (Asia) Private Limited., Tenth Edition, 2011.
2. Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers, Forty Second Edition, 2013
3. Gareth Williams, "Linear Algebra with application", Narosa Publishing House, New Delhi, 2009.
4. Ward Cheney, David Kincaid, "Linear Algebra Theory and application" Jones & Bartlet Publishers, New Delhi, 2010.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X		X											
CO 2	X	X		X											
CO 3	X	X		X											
CO 4	X	X		X											

13CS32 - AUTOMATA THEORY AND DISCRETE MATHEMATICS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

Understand the mathematical logic behind proof techniques, the finite automata theory, context-free grammar and computational aspects of Turing Machines.

COURSE OUTCOMES

- CO1** : *Apply logical reasoning in verifying the correctness and validity of simple instances of valid logical arguments.*
- CO2** : *Ability to devise encoding and decoding procedures for error detection and correction in data transmission problems.*
- CO3** : *Knowledge in constructing system models which are the natural extension of automata that are used to devise decision procedures.*
- CO4** : *Deploy specification of languages using grammars*

MATHEMATICAL LOGIC

Connectives - Conditional and Biconditional statements -Statement formulae and Truth tables -Tautologies and Tautological Implications - Normal forms - Disjunctive and Conjunctive Normal Forms - The Theory of Inference for the Statement Calculus - Consistency of Premises - The Predicate Calculus - Variables and Quantifiers - Special variable formulae involving Quantifiers - Theory of Inference for the Predicate Calculus. **(8)**

ALGEBRAIC STRUCTURES I

Rings, Integral domains and Fields - Properties - Polynomial Rings - Construction of Finite Fields - Irreducible Polynomials - Primitive element of a Finite Field - Primitive Irreducible Polynomials. **(7)**

ALGEBRAIC STRUCTURES II

Residue arithmetic for Computers - Coding theory - Error Detection - Correction - Distance between Code Words - Minimum distance and weight - Group Code, Linear Code and Cyclic Code - Problems under Encoding and Decoding Techniques. **(8)**

FINITE AUTOMATA

Finite State Systems - Basic definitions - Transition diagrams - Deterministic & Nondeterministic Finite Automata - Finite Automata with ϵ -moves - Finite Automata with Output - Moore & Mealy Machine. **(7)**

GRAMMARS

Chomsky Classification of Grammars - Context-Free Grammars - Simplification of Context -Free Grammars - Chomsky Normal Form. **(3)**

PUSH DOWN AUTOMATA

Definitions - Pushdown Automata and Context-Free Languages - Solving problems like O^n , I^n etc. **(3)**

TURING MACHINES

Introduction - The Turing Machine Model - Simulating Computers using Turing Machines - Well-formedness of parentheses - Addition of unary numbers - Multiplication of unary numbers - Recognition of binary palindromes - Recognition of words of the form O^n, I^n . (9)

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. J.P.Tremblay, R.Manohar, "Discrete Mathematical structures with applications to computer science", Tata McGraw-Hill, Edition 1997, Thirty Eighth reprint, 2010.
2. John E.Hopcroft, Rajeev Motwani, Jeffery D. Ullman, "Introduction to Automata Theory, Languages and Computation", Addison Wesley, Pearson Education, Third Edition, Second Impression, 2009.
3. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley Publishing Company, Fifth Edition, Pearson Education, Second Impression, 2008.

REFERENCE BOOKS

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, Seventh Edition, 2012.
2. John.C.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw-Hill, Seventh reprint, 2010.
3. Mishra K.L.P, Chandrasekaran.N. "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall of India, Third Edition, 2008.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X		X							X	X			
CO 2	X	X		X							X	X			
CO 3	X	X		X							X	X			
CO 4		X		X		X						X	X		

13CS33 - DATA STRUCTURES AND ALGORITHMS - I

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To study data structure concepts, related algorithms and their applications.

COURSE OUTCOMES

CO1 : *Acquire knowledge in data structures concepts and related algorithms.*

CO2 : *Deployment of essential data structures such as lists, stacks, queues, trees and graphs to represent real world problems.*

CO3 : *Analyze the computational complexity of computer algorithms.*

DATA, INFORMATION AND ALGORITHM ANALYSIS

Data Vs Information - Representation of Numbers: Integer, Real, Representation of Characters - Definition of an Algorithm - Basic Steps in Development of an Algorithm - Algorithm Notations - Sparks - Algorithm Complexity - Space and Time Complexity - Order Notations - Definition of NP Hard - NP Complete. **(6)**

LINEAR LIST

Definition - Arrays: Representation and Characteristics - Array of Structures - Polynomial Representation - Multidimensional Arrays. **(3)**

STACKS AND QUEUES

Fundamentals of Stacks, Queues and Dequeues - Application of Stacks: Recursion - Conversion of Infix to Postfix and Prefix Expressions - Evaluation of Postfix Expressions - Application of Queues: Wire Routing - Priority Queue - Multiple Stacks and Queues. **(7)**

LINKED LISTS

Singly and Doubly Linked Lists: Basic Operations - Linked Stacks and Queues - Polynomial Manipulation - Multiprecision Arithmetic - Equivalence Relations. **(6)**

SPARSE MATRICES

Representation - Transpose and Multiplication of Sparse Matrices in Three Tuple Form - Sparse Matrices using Linked Lists. **(5)**

CHARACTER STRINGS

Representation: Fixed Length, Workspace Index, Linked List - Operations: Concatenation, Insertion, Deletion, Sub-String, Pattern Matching. **(4)**

TREES

Definition - Binary Trees: Representations, Traversal, Properties - Threaded Binary Trees - Copying and Equivalence of Binary Trees - Binary Tree Representation of General Trees - Application of Trees : Binary Search Trees : Principle, Addition and Deletion of Nodes, Decision Trees, Game Trees. **(7)**

GRAPHS

Terminology and Representations - Warshall Algorithm - Traversals - Biconnectivity - Connected Components - Spanning Trees - Shortest Path - Transitive Closure - Activity Networks - Topological Sort - Critical Paths - Enumerating all Paths - Euler and Hamiltonian Paths. (7)

* Note: Algorithms will be taught in Sparks like notation.

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOK

1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures in C", Galgotia Publications, 2008.

REFERENCE BOOKS

1. Satraj Sahani, "Data structures, Algorithms and applications in C++", McGraw Hill, International Edition, 2005.
2. Jean-Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, second edition, 2008.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	x	x	x	x	x	x							x		
CO 2	x	x	x	x	x	x							x		
CO 3	x	x	x	x	x	x							x		

13CS34 - ELECTRICAL MACHINES AND CIRCUIT THEORY

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the fundamentals of the construction, working principle, characteristics and application of D.C. and A.C motors. To study network theorems and their applications. To enable the students to know the concepts of resonance and transients in A.C and D.C circuits.

COURSE OUTCOMES

CO1 : Ability to describe the principles and characteristics of electrical machines.

CO2 : Analysis of AC and DC circuits using network theorems.

CO3 : Application of electrical machines in industry.

DC MOTORS

D.C. Motors: Principle of Operation - Construction - Types and Characteristics of shunt, series and compound motor - Torque Equation - Starting methods - Braking of Electrical motors. Transformers - Construction - EMF equation - OC and SC Test - Equivalent circuit. **(8)**

AC MOTORS

Alternators: Construction - EMF equation - Synchronous Motor: Principle of Operation - Starting - Applications. Three Phase Induction Motor: Construction and Types - Principle of Operation - Torque Slip Characteristics - Starting methods - Single phase Capacitor Start and Run induction Motor - Stepper motor. **(9)**

NETWORK THEOREMS

Superposition theorem - Thevenin's theorem - Norton's theorem - Maximum Power transfer theorem - Reciprocity theorem - Compensation theorem - Tellegen's theorem - Millman's theorem - Statement and applications in D.C. and A.C. Circuits. **(9)**

RESONANCE AND COUPLED CIRCUITS

Resonance - Series resonance - Resonant frequency - Variation of resistance, inductance and capacitive reactance with frequency - Quality factor - Selectivity - Half Power frequencies - Band width. Parallel Resonance - Two branch circuits - Variation of capacitance and inductive susceptance, impedance and current with frequency - Quality factor - Selectivity - Physical interpretation. Self and mutual inductance - Co-efficient of coupling - Natural current - Dot rule - series and Parallel connection of coupled circuits - Tuned coupled circuits - Conductively coupled equivalent circuits. **(10)**

TRANSIENT ANALYSIS

Transient concepts - Transient response of simple RL, RC and RLC series circuits to step and sinusoidal inputs using Laplace transform method - Natural frequency and Damping factor. **(9)**

TOTAL : 45

TEXT BOOKS

1. A. Sudhakar, Shyammoan S Palli, "Circuits and Networks (Analysis and Synthesis)", Third edition, Tata McGraw-Hill Publishing, 2006
2. Nagrath.I.J., and Kothari, D.P., "Electrical Machines", Tata McGraw Hill, Third edition, 2007.

REFERENCE BOOKS

1. P.K. Mukherjee and S. Chakravarthi "Electrical machines", Dhanpat Rai Publications (P) Ltd.,2010.
2. C. K. Alexander, M. N. O. Sadiku, "Fundamentals of electric circuits", Third edition McGraw-Hill 2007.
3. A. Chakravarthi, "Circuit Theory (Analysis and Synthesis)", First edition, Dhanpat Rai & Co. New Delhi, 2009.
4. Roy Choudhury, D., "Networks and Systems", Wiley Eastern, New Delhi, Second edition, 2010.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X			X							X	X		X	
CO 2	X			X							X	X		X	
CO 3	X			X							X	X			

13CS35 - COMPUTER ARCHITECTURE

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge on the basic structure, functions and characteristics of computer systems and understand the design of its various functional units.

COURSE OUTCOMES

- CO1** : Knowledge in basic structure and functional units of computer systems like ALU, control unit, memory and peripheral interface and addressing modes.
- CO2** : Ability to apply various design concepts such as pipelining and microprogramming in the design of the central processing unit of a computer system.
- CO3** : Ability to identify the different architectural and organizational design issues that can affect the performance of a computer such as Instruction Sets design, Pipelining, RISC architecture, and Superscalar architecture.
- CO4** : Knowledge in memory hierarchy including virtual, cache and associative memory, data transfer and input /output operations.

MACHINE INSTRUCTIONS AND ARITHMETIC OPERATIONS

Instruction and Instruction sequencing - Addressing modes - Basic I/O operations - Stacks and queues - Subroutines. Arithmetic algorithms for Additions, Subtraction, Multiplication and Division on Signed magnitude, 2's compliment numbers and Floating point Numbers. **(10)**

BASIC PROCESSING UNIT

Register Transfers - Performing an Arithmetic or Logic Operation - Fetching a word from memory - Storing a Word from Memory. Execution of a complete instruction - Bus Structures - Multiple bus organization - Hardwired control. Microprogrammed Control: Microinstructions - Micro program sequencing - Wide - Branch Addressing - Microinstructions with Next - Address Field - Perfecting Microinstructions - Emulation - RISC Vs CISC. **(9)**

PIPELINING

Role of Cache Memory - Pipeline Performance. Data hazards: Operand Forwarding - Handling Data Hazards in Software. Instruction Hazards: Unconditional Branches - Conditional Branches and Branch Prediction. Influence on Instruction sets: Addressing modes - Condition Codes. Data path and control consideration - Superscalar operation: Out-of-Order Execution - Execution Completion - Dispatch Operation - RISC pipelining. **(9)**

MEMORY SYSTEM

Memory Hierarchy - Memory Address Map - Memory Connection to CPU - Associative Memory: Hardware Organization - Match Logic - Read and Write Operation. Cache Memory : Associative mapping - Direct Mapping - Set Associative Mapping - Writing into Cache - Cache Initialization. Virtual Memory : Address Mapping using Pages -Associative Memory Page Table - Page Replacement. **(8)**

I/O ORGANIZATION

Accessing I/O devices - Interrupts - Direct Memory Access - Bus Arbitration. Buses: Synchronous Bus and Asynchronous Bus. Interface circuits: Parallel Port and Serial Port. (9)

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", McGraw-Hill, Fifth Edition, 2007.
2. Morris Mano, "Computer System Architecture", Prentice Hall of India, Third Edition, 2008. (for Arithmetic Algorithms, RISC Vs CISC, RISC Pipelining and Memory Systems Only).

REFERENCE BOOKS

1. William Stallings, "Computer Organization and Architecture - Designing for Performance", Pearson Education, Ninth Edition, 2012.
2. David A. Patterson and John L.Hennessy, "Computer Organization and Design: The Hardware / Software Interface", Morgan Kaufmann, Fifth Edition, 2013.
3. John P.Hayes, "Computer Architecture and Organization", McGraw Hill, Sixth Edition, 2007.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X											X			
CO 2	X										X	X			
CO 3	X			X		X					X	X			
CO 4	X			X		X					X	X	X		

13CS36 - OBJECT ORIENTED PROGRAMMING AND JAVA

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Acquire knowledge in object oriented programming principles and concepts like Data abstraction, polymorphism and Inheritance. Gain knowledge in concepts like Exception handling, threads, Applets in Java.

COURSE OUTCOMES

CO1 : *Ability to design objects for a specific application in JAVA*

CO2 : *Identify, formulate engineering problems using Object Oriented Programming concepts*

OBJECT ORIENTED PROGRAMMING

Introduction to object oriented languages - Evolution of object oriented languages - Object oriented programming paradigm - Basic concepts of object oriented programming - Procedural Vs object oriented programming. **(6)**

INTRODUCTION TO JAVA

Java and Internet - Byte Code - Features of Java - Java Development Environment- Java Programming: Methods and Classes - Constructor - Garbage Collection - Overloading - Inheritance - Overriding - Packages and Interfaces - Java I/O systems - String Handling : String and String Buffer. **(12)**

EXCEPTION HANDLING

Exception Handling: Fundamentals of Exception handling and types - Built in Exceptions - user defined Exceptions. **(5)**

THREADS AND NETWORKING

Multithreaded Programming : Thread Model - Thread properties - Thread priorities -Synchronization- Inter thread communication-Networking : Inet address - Datagrams - Sockets - URL connections. **(11)**

APPLET AND DATABASE CONNECTIVITY

Introduction to Abstract Window Tool kit - Applet class - HTML applet tags - Parameter passing - Audio clip interface - Event class: Keyboard and Mouse events handling. Data Base Connectivity: basic structure of JDBC API. **(11)**

TOTAL : 45

TEXT BOOK

1. Herbert Schildt, "Java 2 - Complete Reference", Tata McGraw Hill, Eighth Edition, 2007.

REFERENCE BOOK

1. Deitel H.M and Deitel P.J, " Java - How to Program", Prentice Hall of India, Ninth Edition, 2012.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X		X		X	X					X	X			
CO 2	X		X		X	X					X	X			

13CS41 - NUMERICAL METHODS, STATISTICS AND RANDOM PROCESSES

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To incorporate the concepts of Numerical Method required for solving Engineering problems which do not have closed form solution. To impart the concepts of the basic Statistical ideas, sampling theory and random process those are imperative for effective understanding of engineering subjects.

COURSE OUTCOMES

CO1 : Apply Numerical methods concepts to solve various problems.

CO2 : Apply statistical ideas to study and analyze models.

CO3 : Apply sampling theory and random process ideas to analyze and solve problems.

NUMERICAL METHODS - I

Linear simultaneous equations : Gauss elimination method - Gauss Jordan method - Crout's method - Gauss seidal method - Relaxation method. Ordinary differential equations : Taylor's series - Modified Euler's - Runge - kutta fourth order methods - Milne s predictor - corrector method. **(9)**

NUMERICAL METHODS - II

Finite difference approximations - solution of PDE - Laplace equation - Liebmanns iteration process - Poisson equation - Parabolic equation - Bender Schmidt and Crank - Nicholson methods - Hyperbolic equation. **(9)**

TWO DIMENSIONAL RANDOM VARIABLES

Probability mass function - Probability distribution function - Cumulative distribution function - Marginal probability functions - Conditional distribution - Expectation of two dimensional random variables - Covariance - Correlation - regression - curve fitting - least square technique - only curve of the form or reducible to the form. **(9)**

SAMPLING THEORY

Elements of sampling theory - Large sample tests - Test for mean, variance and proportions - small sample tests-t, F, chi-square tests - contingency table - test for independence. **(9)**

RANDOM PROCESSES

Classification of random processes - Special classes of Random processes - Average values of Random processes - Stationarity - Analytical representation of random processes - Auto correlation function and its properties - Cross-Correlation function and its properties - Ergodicity - Mean Ergodic theorem - Correlation Ergodic process - Distribution Ergodic process - Power spectral Ergodic density function and its properties. **(9)**

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Kandasamy. P., et al., "Numerical methods", S.Chand and Compnay, 2013.
2. Veerarajan T, "Probability Statistics and Random Process," Tata Mc Graw Hill publishing company Ltd,Third edition, 2009.
3. Venkataraman M.K, "Higher mathematics for Engineering and Science" National Publishing Company,2000.
4. Kandasamy P., et al, "Probability Statistics and Random Process", S Chand and Company 2013.

REFERENCE BOOKS

1. Erwin Kreyszig., "Advanced Engineering Mathematics", Tenth Edition John Wiley and Sons (Asia) Private Limited,2011.
2. Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers, Forty Second Edition, 2013.
3. Kapoor.J.N and Saxena, H.C., "Mathematical Statistics", S Chand and Company, Twelfth Edition Reprint, 2013.
4. Grewal, B.S., "Numerical Methods in Science and Engineering", Khanna Publishers, Ninth Edition Reprint, 2013.
5. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", Prentice-Hall, Inc., Englewood Cliffs, New Jercey, 2003.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X		X											
CO 2	X	X		X	X					X					
CO 3	X	X		X	X					X					

13CS42 - ENGINEERING MECHANICS AND STRENGTH OF MATERIALS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To introduce the fundamentals of load, application of load, transfer of load, different types of beams and truss and motion of particles. To give exposure on torsion of shafts and fundamentals of mechanical vibrations of rigid bodies.

COURSE OUTCOMES

CO1 : Understand the fundamentals of application of loads on bodies and their reactions.

CO2 : Ability to analyze on plane trusses

CABLES AND TRUSSES

Analysis of statically determinate plane trusses - method of joints, method of sections - tension coefficient method - analysis of parabolic cables. (7)

CONCEPT OF STRESS AND STRAIN

Simple stresses and strains at a point - normal and shear stresses - Hook's law - Young's modulus - bars subjected to axial forces - simple problems. Thermal stresses - simple problems. Poisson's ratio - modulus of rigidity - surface and volume strains - bulk modulus - relation between elastic constants. Simple tension test on mild steel rod. Stress - Strain diagram - concept of factor of safety and permissible stresses. (12)

BEAMS AND BENDING

Types of beams - types of loads and loading diagrams - shear force and bending moment - relationship between loading intensity, shear force and bending moment - shear force and bending moment diagrams for statically determinate beams. (11)

TORSION

Torsion of solid and hollow circular shafts - power transmitted through shafts. (5)

KINEMATICS AND KINETICS

Newton's second law - equations of motion - motion of connected bodies - mechanical vibrations - simple harmonic motion - free vibration of rigid bodies without damping - natural frequency. (7)

MECHANISMS

Four bar chain, slider crank. Chain and their mechanisms. (3)

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Khurmi, R.S. "Applied Mechanics and Strength of Materials", S.Chand & co. New Delhi, 2006.
2. Beer F.P. and Johnson Jr.E.R."Vector Mechanics for Engineers - Statics and Dynamics", McGraw Hill, International Edition, 2006.
3. Khurmi, R.S and Gupta J.K. "Theory of Machines" Eurasia Publishing House (Pvt.) Ltd., New Delhi, 2007.

REFERENCE BOOKS

1. Rajasekaran, S., Sankarasubramaniam, G."Fundamentals of Engineering Mechanics", Vikas publishing House Private Ltd., 2007.
2. Palanichamy, M.S. Nagan, S. "Engineering Mechanics - Statics and Dynamics', Tata McGraw Hill, 2006.
3. Ramamrutham, S. and Narayan, R. "Strength of Materials", Dhanpat Rai Publishing & Co., New Delhi, 2007.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X				X									
CO 2	X	X				X									

13CS43 - DATA STRUCTURES AND ALGORITHMS - II

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To study data structure concepts, related algorithms, their applications and algorithm design techniques.

COURSE OUTCOMES

- CO1** : *Understand and analyze sorting, searching algorithms with their complexities and their application to real world problems.*
- CO2** : *Understand file management and dynamic storage management techniques used in typical operating systems.*
- CO3** : *Choose the appropriate data structure and algorithm design method for a specified application.*
- CO4** : *Assess how the choice of data structures and algorithm design methods impacts the performance of programs.*

FILES

External Storage Devices - Definitions and Concepts - Record Organization - Sequential Files - Indexed Sequential Files: Structure and Processing - Other Method of File Organizations: VSAM - Multiple Key Access: Multilist, Inverted List, Cellular Partitions. (7)

SORTING

Introductory Considerations - Internal Sorts : Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Shell Sort, Heap Sort, Quick Sort, Radix Sort, Address Calculation Sort - External Sorts : Polyphase Sort, Oscillating Sort, Sorting on Discs - Extended Run List- Time Complexity for Sorting Algorithms. (9)

SEARCH STRATEGIES

Sequential Search - Binary Search -Extended Binary Tree - Huffman Coding- Search Trees: Height Balanced Trees, 2-3 Trees, Weight Balanced Trees, B-Tree, B+ Trees, Tries, Red Black Trees, Tournament Trees. (9)

HASH TABLE METHODS

Introduction- Hashing Functions - Hashing Methods - Collision Resolution Techniques - Time Complexity for Searching Algorithms. (5)

DYNAMIC STORAGE MANAGEMENT

First Fit - Best Fit - Storage Release - Boundary Tag Method - Buddy System - Garbage Collection - Compaction. (7)

ALGORITHMS DESIGN

Basic Steps in Complete Development of an Algorithm - Algorithms and Design Methods: Sub Goals, Hill Climbing and Working Backward, Heuristics, Back Track Programming, Branch and Bound, Simulated Annealing - Knapsack Problem (Back Tracking)-Traveling Salesmen Problem(Branch and Bound). **(8)**

- **Note : Algorithms will be taught in Sparks like notation.**

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Jean Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, Second Edition, 2008.
2. Horowitz E., Sahni S., and Rajasekaran Sanguthevar, "Fundamental of Computer Algorithms", Universities Press (Computer Science), 2008.

REFERENCE BOOKS

1. Alfred V. Aho, John. E. Hopcroft, Jeffrey D, Ullman, "Data Structures and Algorithms", Pearson Education, 2002.
2. Anany Levitin, "Introduction to the design and analysis of Algorithms", Pearson, Third edition, 2011

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X	X	X	X							X		
CO 2	X	X	X	X	X	X							X		
CO 3	X	X	X	X	X	X							X		
CO 4	X	X	X	X	X	X							X		

13CS44 - ELECTRONIC CIRCUITS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To acquire knowledge on the principles of operation, characteristics and applications of semiconductor diodes, analysis of transistor amplifier and oscillator circuits, concepts of power amplifiers, series and shunt voltage regulators, multivibrators and Timer circuits.

COURSE OUTCOMES

- CO1** : Understand the small signal analysis of BJT and FET circuits and ability to apply the same in design problems.
- CO2** : An in-depth knowledge on Frequency response of BJT, FET Amplifiers and model their equivalent circuits.
- CO3** : An in-depth knowledge of power amplifiers, voltage regulators and feedback Amplifiers, multivibrator and Timer circuits.

SEMICONDUCTOR DIODES

PN junction diode-Characteristics and Parameters-DC Load Line Analysis-Diode AC Models-Half-Wave and Full-Wave Rectification-Half-Wave and Full-Wave Rectifier Power Supply-RC and LC Power Supply Filters-Analysis of Series and Shunt Clipping Circuits-Clamping Circuits-DC Voltage Multipliers-Zener diodes-Design of Zener diode voltage regulators. **(9)**

BJTs AND FET

Bipolar Junction Transistor operation-Voltages and currents-Amplification-Switching-CE characteristics-DC Load Line and Bias Point- Voltage-Divider bias circuit design-JFET Characteristics-FET Amplification and Switching- Enhancement MOSFET, Depletion MOSFET-Biasing FET Switching Circuits-UJT Characteristics-UJT Relaxation Oscillator. **(9)**

AMPLIFIERS

AC Load Lines-h- Parameters- Analysis of Common Emitter circuit -Single Stage CE Amplifier- Analysis of Common-Source Circuit -Single Stage Common-Source Amplifier- Differential amplifier-Operational amplifiers-Parameters-Voltage Follower Circuits-Non-inverting Amplifiers-Inverting Amplifiers-Summing Amplifier-Difference Amplifier-Instrumentation Amplifier-Voltage Level Detectors-Power Amplifiers-Transformer-Coupled Class A, Class B, Class AB, Class C Amplifier- Design of Transformer-Coupled Amplifiers. **(9)**

FEEDBACK AMPLIFIERS AND OSCILLATORS

Effect of feedback on input impedance, output impedance, gain, noise and stability - Design of Series and Shunt Voltage and Current Feedback Circuits - Analysis and Design of Hartley, Colpitts, RC phase shift, Wein Bridge and Crystal Oscillators. **(9)**

MULTIVIBRATORS AND TIMER CIRCUITS

Analysis and design of Collector-coupled, Monostable, Bistable and Astable multivibrators - Schmitt trigger-Voltage Time base generators-Exponential Sweep-Transistor Constant Current Sweep-Miller and Bootstrap Time Base Generators-Square wave and Triangle wave generators using opamp-Design of multivibrator using 555 timers. **(9)**

TOTAL : 45

TEXT BOOKS

1. David A.Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth Edition, 2008.
2. Allen Mottershed, "Electronic Devices and Circuits - An introduction", Prentice Hall of India, 2007.

REFERENCE BOOKS

1. Millman & Taub, "Pulse Digital & Switching waveforms ", Tata McGraw Hill, Twenty Seventh Reprint, 2007.
2. Roy Choudhury, Shail Jain, "Linear Integrated Circuits", Wiley India Publishers, 2004.
3. Jacob Millman & Christos C.Halkias, "Electron Devices and Circuits", Tata McGraw Hill, Thirtieth Reprint, 2004.
4. Dharma Raj Cheruku & Battula Tirumal Krishan, "Electronic Devices and Circuits", Pearson Education India, First Indian Print, 2005.
5. Robert L. Boylestead and Louis Nasheresky, "Electron Devices and Circuits: Theory and Practice", Prentice Hall of India, Tenth Edition 2009.
6. Sedra and Smith," Microelectronic Circuits", Oxford University Press, Fifth Edition, 2004.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X		X								X		X	
CO 2	X	X		X								X		X	
CO 3	X	X		X								X		X	

13CS45 - ANALOG AND DIGITAL COMMUNICATION

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge in modulation, demodulation techniques and coding theory. To know the basic concepts of data communication and transmission media.

COURSE OUTCOMES

CO1 : *Apply modulation and demodulation techniques in designing communication systems*

CO2 : *Attain basic knowledge in coding theory.*

CO3 : *Apply the knowledge of data communication and transmission media for improving the performance of various networks.*

MODULATION

Need for modulation - Analog modulation systems - Basics of AM, FM & PM - Modulation and Demodulation schemes - Sampling theorem - Basics of PAM, PDM & PPM - Generation and recovery - PCM - Encoder - Decoder - Eye pattern - DPCM - Delta Modulation - Adaptive Delta Modulation - Time Division Multiplexing - T1 Digital carrier - Frequency Division Multiplexing. **(9)**

DIGITAL MODULATION AND DATA TRANSMISSION

Binary Phase Shift Keying - Differential Phase Shift Keying - Differentially Encoded Phase Shift Keying (DEPSK) - Quadrature Phase Shift Keying (QPSK) - M-ary PSK - Quadrature Amplitude Shift Keying (QASK) - Binary Frequency Shift Keying - Baseband Signal Receiver - The Matched filter - Coherent Reception: PSK, FSK, QPSK- Comparison of Error Probability for BPSK, BFSK, QPSK. **(9)**

CODING THEORY

Shannon's Theorem, Channel Capacity - Coding for Error detection and correction - Linear block codes - Cyclic codes - Burst error Correction - Convolution codes - Introduction to Turbo Codes. **(9)**

DATA COMMUNICATIONS

Data Communication Modems, Serial and Parallel Interfaces, Data Link Protocols - Asynchronous and synchronous Data Link Protocols - Hierarchical Structure - Local Loops - Trunks and Multiplexing - Switching - Circuit, Packet and Message - Crossbar Switches - Space Division and Time Division Switches - PSTN - ISDN - Services - ATM - Standard Channel Rates - ATM Switches - SONETS. **(9)**

TRANSMISSION MEDIA

Cables - Coaxial, Twisted Pair, Fiber Optic - Optic Fiber Communication Systems - Block diagram of a Microwave Radio transmitter and receiver - Microwave Radio Repeaters - Frequency and Space Diversity - Cellular telephone - Frequency reuse- Interference - Cell Splitting, Sectoring, Segmentation and Dualization - Cellular system topology- Roaming and Handoff-AMPS, GSM, CDMA Standards - Wireless LAN - WPAN - WMAN - Satellite Communication - VSAT - Transmission Path Loss and EIRP. **(9)**

TOTAL : 45

TEXT BOOKS

1. Herbert Taub & Donald L. Schilling, "Principles of Communication", McGraw Hill International Student Edition, Third Edition 2008.
2. Wayne Tomasi, "Electronic Communication Systems: Fundamentals Through Advanced", Pearson Education, Fifth Edition, 2009.

REFERENCE BOOKS

1. Simon Haykin, "Communication Systems", John Wiley & Sons, Fourth Edition, 2004.
2. Behrouz.A. Forouzan, "Data Communication and Networking", Tata McGraw Hill, Fourth Edition, 2006.
3. Lathi B.P, "Modern Digital and Analog Communication Systems", Oxford university press, Fourth Edition, 2004
4. Roy Blake, "Electronic Communication Systems", Thomson Delmar, second Edition, 2002.
5. Sam K Shanmugam, "Digital and Analog Communication Systems", John Wiley, Student Edition, John Wiley, 1985.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X		X						X				X	
CO 2	X	X		X						X				X	
CO 3	X	X		X						X				X	

13CS46 - SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the software engineering principles, process models, various phases of software design and development activities and gain insight in to software architectural aspects, design issues, coding, testing and quality assurance activities.

COURSE OUTCOMES

- CO1** : *Understand, define and document user requirements.*
- CO2** : *Selection and Application of suitable design principles and development methodologies.*
- CO3** : *Ability to estimate, plan and schedule the activities, monitor and control changes to the software work products.*
- CO4** : *Knowledge in coding standards and testing techniques and use of tools.*

INTRODUCTION

The Problem Domain - Software Engineering Challenges - Software Engineering Approach, The Software Processes: Software Process - Desired Characteristics of Software Process - Software Development Process Models - Requirements Change Management Process **(9)**

SOFTWARE REQUIREMENTS AND ARCHITECTURE

Software Requirement Analysis and Specification: Software Requirements - Problem Analysis - Informal approach - Data flow modeling - Requirements Specification -Functional Specification with Use Cases - Basics - Examples - Developing use cases - Validation - Metrics.

Software Architecture: Role of Software Architecture - Architecture Views - Component and Connector View - Architecture Styles for C&C View - Pipe & Filter, Shared Data and Client Server styles. **(9)**

SOFTWARE DESIGN

Function Oriented Design: Design Principles - Module - Level Concepts - Design Notation and Specification - Structured Design Methodology - verification - Metrics.Object Oriented Design: OO Analysis and OO Design - OO Concepts - Design Concepts - Unified Modeling Language. Detailed Design: Detailed Design and PDL - Verification - Metrics **(11)**

CODING AND TESTING

Programming Principles and Guidelines - Coding Process - Verification: code inspection - static analysis - Metrics. Testing Fundamentals - Black-Box Testing: Equivalence class partitioning - Boundary value analysis - Cause Effect graphing - state based testing -White-Box Testing : control flow based criteria - data flow based testing - example Mutation testing - Testing Process - Defect Analysis and Prevention **(9)**

PLANNING A SOFTWARE PROJECT

Process Planning - Effort Estimation - COCOMO and Function Points - Project Scheduling and Staffing - Software Configuration Management Plan - Quality Plan - Risk management - Project monitoring plan.

(7)

TOTAL : 45

TEXT BOOK

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House, Third Edition, 2009, Reprint.

REFERENCE BOOKS

1. Roger.S.Pressman "Software Engineering A Practitioner's Approach", McGraw Hill International Edition, Seventh Edition, 2009.
2. Ian Sommerville, "Software Engineering", Dorling Kindersley (India) Private Ltd., Eighth Edition, 2008
3. Ali Bahrami, "Object Oriented systems Development", McGraw Hill Education International Edition, Second Edition, 1999.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X			X							X			
CO2			X		X		X			X					
CO3	X		X				X			X					
CO4		X	X				X								

13CS47 - ELECTRICAL AND ELECTRONICS LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

To understand the characteristics of electrical machines by conducting basic tests on them. To acquire knowledge in network theorems, transient response of simple electric circuits, amplifiers, multivibrators, oscillator circuits and timer circuits.

COURSE OUTCOMES

The students will be able to

CO1 : *analyze the performance of electrical machines using different tests.*

CO2 : *verify network theorems and apply them to dc and ac circuits.*

CO3 : *verify transient response and frequency response of RLC circuits.*

CO4 : *design amplifier, oscillator, multivibrators and waveform generators for the given requirements.*

LIST OF EXPERIMENTS

1. Calibration of voltmeter and ammeter
2. Calibration of wattmeter
3. No-load speed characteristics of DC shunt motor
4. Swinburne's Test
5. Load Test on DC shunt motor
6. Load Test on DC series motor
7. Load Test on single phase two winding transformer
8. Open Circuit and short circuit tests on single phase two winding transformer
9. Load test on three-phase squirrel cage induction motor
10. Load test on three-phase slip ring induction motor
11. Load test on single-phase capacitor start induction motor
12. Load test on alternator
13. AC voltage controller for fan speed control
14. DC servo motor position control system
15. AC servo motor position control system
16. Stepper motor control system
17. Verification of network theorems
18. Frequency response of RLC Series resonance circuit
19. Transient response of simple RL, RC and RLC series circuits to step and sinusoidal inputs

20. Design of amplifier using BJT and FET
21. Linear applications of operational amplifier
22. Design of multivibrators using 555 timers
23. RC phase shift oscillator
24. Square wave and triangle wave generators using operational amplifier

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X											X			
CO 2	X	X					X	X							
CO 3	X	X					X	X				X			
CO 4	X											X		X	

13CS48 - DATA STRUCTURES AND ALGORITHMS, OOP AND AUTOMATA LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

Acquire knowledge in object oriented programming principles and concepts like Data abstraction, polymorphism, reusability, Exception handling, threads, Applets in Java. Gain knowledge in data structures concepts such as lists, stacks, queues, and trees to represent real world problems. To understand the concepts of finite, pushdown automata and Turing machines.

COURSE OUTCOMES

- CO1** : *Ability to implement the concepts like Exception handling, threads, Applets in Java.*
- CO2** : *Gain practical knowledge in implementing the essential data structures such as lists, stacks, queues, and trees to represent real world problems.*
- CO3** : *Choose the appropriate data structure and algorithm design method for a specified application and solve the problem systematically by writing programs for these solutions.*
- CO4** : *Ability to construct system models which are the natural extension of automata that are used to devise decision procedures.*

OOP (JAVA)

1. Control statements in Java.
2. Classes.
3. Inheritance.
4. Exception Handling.
5. Packages & Interface.
6. Multithreading.
7. Applet and AWT Tools.
8. Database Connectivity.
9. Socket programming using TCP and UDP.

DATA STRUCTURES

1. Operations on Stacks, Queues, Linked lists.
2. Stack Applications.
3. Polynomial operations using Linked List.
4. Operations on Trees, Graphs.
5. Applying searching and sorting algorithms for given applications.

AUTOMATA

1. Well-formedness of parenthesis.
2. Addition of unary numbers.
3. Multiplication of unary numbers.
4. Recognition of binary palindromes.
5. Recognition of words of the form 0^n1^n .

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X	X		X						X			
CO 2	X	X				X					X				
CO 3	X	X				X					X				
CO 4	X	X									X				

13CE49 - SCIENCE OF CREATIVITY AND PROFESSIONAL ETHICS

L	T	P	C
2	0	0	2

ASSESSMENT : THEORY

COURSE OBJECTIVE

Students will have a deeper understanding of the life process and Nature's prevailing Law of Cause and Effect. It will help them to acquire an expanded awareness of their actions, and hence would walk more gently on this planet, creating love, peace and harmony wherever they go.

COURSE OUTCOMES

- CO 1** : *Inculcate among students the need for creative thinking and personality development.*
- CO 2** : *Acquire knowledge about evolution of the Universe and evolution of living beings.*
- CO 3** : *Understand the benefits of yoga and introspection for better living.*
- CO 4** : *Learn about human values, priority, developing self-confidence and team spirit.*
- CO 5** : *Deep understanding of personal responsibility and professional ethics, for sustained growth in career and life*

LIFE FORCE, MIND AND CONCIIOUSNESS

Science of Creativity and Personality Development - Objectives - Principles of Karma Yoga - Duty Consciousness - Communism and Capitalism - Law of Nature - Life Force - Origin - Potentiality of the Life Force - Primordial State - Wave Theory - Consciousness - Pancha Thanmatras - Secret of Revelations - Mind - Biomagnetism - Physical Transformation of Biomagnetism - Attachment, Detachment and Moderation in Enjoyment. **(9)**

EVOLUTION OF THE UNIVERSE AND LIVING BEINGS

Evolution of the Universe: Creation Theory - Evolution Theory - Theory of Permanence - Theory of Mithya - Big-Bang Theory - Evolution of Living Beings: Absolute Space and Force - Plants Experience Pain - Two Eyes and Two Ears - Seven Constituent Layers in the Body - Totality and Man - Six Temperaments - Realization of Truth - Space is The Almighty - Science and Spiritualism. **(9)**

YOGA AND INTROSPECTION

Simple and Safe Yoga - Physical Exercise - Meditation - Seven Centers of Meditation - Benefits - Effect of Good Vibrations - Cause and Effect System - Imaginary Expectations - Harmony in Life: Self, Family, Society and Nature - Introspection: Analysis of Thought, Moralization of Desire, Neutralization of Anger, Eradication of Worries and Self Realization. **(9)**

HUMAN VALUES

Morals, Values and Ethics - Integrity - Work Ethics - Service Learning - Virtues - Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment- Empathy - Self Confidence - Challenges in Work Place - Impact of cyberspace on individuals. **(9)**

ENGINEERING ETHICS, RESPONSIBILITIES AND RIGHTS

Senses of Engineering Ethics - Moral Issues - Inquiries - Moral Dilemma - Moral Autonomy - Profession and Responsible Professionalism - Social Responsibility - Collegiality, Loyalty and Confidentiality - Human and Employee Rights - Intellectual Property Rights. (9)

TOTAL : 45

TEXT BOOKS

1. Yogiraj Vethathri Maharishi, "Karma Yoga - The Holistic Unity", Vethathri Publications, Fourth Edition, 2009.
2. R.S.Naagarazan, "A Textbook on Professional Ethics and Human Values", New Age International Publishers, New Delhi, 2011.

REFERENCE BOOKS

1. Sadhguru, "Body the Greatest Gadget and Mind is your Business", Diamond Pocket Books Pvt. Ltd, Isha Foundations, 2013.
2. Swami Vivekananda and Swami Nikhilananda, "Karma Yoga and Bhakti Yoga", Second Edition, Ramakrishna Vivekananda Publications, 2008.
3. Henry Dreyfuss, "The Measure of Man and Woman: Human Factors in Design", John Wiley and Sons Publications, 2012.
4. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Fourth Edition McGraw Hill, New York, 2005.
5. M. Govindarajan, S. Natarajan, V.S. Senthilkumar, " Engineering Ethics", First Edition, Prentice Hall of India, 2009.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1							X								X
CO 2								X							
CO 3									X						X
CO 4							X		X						X
CO 5									X						X

13CS51 - OPERATING SYSTEMS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Understand the evolution, functions of an operating system, concepts related to processes, process control, process management, synchronization and mutual exclusion, various memory management techniques, I/O and file management and overview of System software.

COURSE OUTCOMES

CO1 : *Gain knowledge in the functions, structures, types of operating systems and system software.*

CO2 : *Familiar with resource management concepts including process scheduling, multi-threading, synchronization, deadlocks, virtual memory, file system and disk scheduling.*

CO3 : *Ability to analyze design issues associated with operating systems and able to impart modifications in operating system components.*

OPERATING SYSTEM OVERVIEW

Introduction to system software - Objectives and functions of OS - Evolution of OS - Distributed system - Real-Time systems - Operating system components - Interrupts - System call - Virtual machines - Symmetric Multiprocessing - Microkernel. **(3)**

PROCESS DESCRIPTION AND CONTROL

Process - Process states - Process description - Process control - Processes and Threads - Uniprocessor Scheduling: Types of Processor Scheduling - Scheduling Algorithms - Overview of Multiprocessor Scheduling and Real time scheduling. **(10)**

MUTUAL EXCLUSION AND SYNCHRONIZATION

Principles of concurrency - Mutual exclusion: Software and hardware approaches - Semaphores - Monitors - Message Passing - Readers/ Writers problem. Deadlock and Starvation: Principles of deadlock - Deadlock Prevention - Deadlock Detection - Deadlock Avoidance. **(10)**

MEMORY MANAGEMENT

Memory management requirements - Memory partitioning - Loading and Linking - Paging - Segmentation. Virtual Memory: Hardware and control structures - Operating Systems software: Fetch Policy, Placement policy, Replacement policy, Resident set management, Cleaning policy, Load control. **(10)**

I/O MANAGEMENT AND FILE MANAGEMENT

I/O devices - Organization of I/O function - OS design issues - I/O buffering - Disk scheduling. File management: Overview - File organization and access - File directories - File sharing - Record blocking - Secondary storage management. **(8)**

OTHER SYSTEM SOFTWARES

Macro processor - Features, Design - Linkers - Loaders : Loader schemes. **(4)**

TOTAL : 45

TEXT BOOKS

1. William Stallings, "Operating Systems Internals and Design Principles", Prentice- Hall of India Private Ltd, Seventh Edition, 2009.
2. John J Donovan, "System Programming", McGraw Hill Publication, Reprint, 2009.

REFERENCE BOOKS

1. Leland L.Beck, D.Manjula, "System Software", Pearson Education, Third Edition, 2007.
2. Silberchatz, Galvin, Gagne, "Operating System Concepts", John Wiley, Eighth Edition, 2009.
3. Harvey M. Deitel, Paul J. Deitel, David R. Choffnes, "Operating Systems", Prentice Hall, Third Edition, 2004.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X													
CO 2	X	X										X			
CO 3		X										X	X		

13CS52 - RESOURCE MANAGEMENT TECHNIQUES

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To learn techniques in the management of computer resources using concepts like optimization, inventory models, queuing theory and replacement policies with the help of mathematical modeling and quantitative analysis.

COURSE OUTCOMES

- CO1** : Ability to formulate and solve optimization problems using Linear and dynamic programming, queuing theory and scheduling
- CO2** : Ability to apply the knowledge gained on simulation, queuing theory and scheduling methods in providing optimum solution for a industry problem.
- CO3** : Apply replacement policies, dynamic programming concepts in solving Resource allocation problem.

LINEAR PROGRAMMING

Linear inequalities - Feasible solutions - Equality principles - Simplex algorithm and its variants: Artificial Variables Techniques, Duality in LPP, Primal - Dual relationship - transportation and assignment problems. Integer Programming: Gomory's cutting plane methods. **(10)**

INVENTORY

Functions of inventories - Costs associated with inventory - Elementary inventory models - Price break model - Economic order quantities - Safety stocks. **(6)**

QUEUING THEORY AND SIMULATION

Poisson arrivals - Exponential service times - Basic equations - Single channel model : (M/M/1) : (∞ /FCFS), (M/M/1) : (N/FCFS), Simulation: Monte - Carlo technique, use of random numbers. **(7)**

PERT/CPM

Critical Path Methods (CPM) - Program evaluation and review techniques (PERT) -Time - Cost analysis - Crashing **(6)**

DYNAMIC PROGRAMMING

Characteristic features, functions, equations - Analysis - Computational procedures for solution - Stage Coach problem, Cargo loading problem, Resource allocation problem. **(6)**

REPLACEMENT MODELS

Individual replacement Policy: Basic concept Money Value, Present Worth Factor (PWF) and Discount Rate, Group replacement policy. **(10)**

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOK

1. Dharani Venkatakrisnan, "Operations Research -Principles and Problems", Keerthi Publication, 2004.

REFERENCE BOOKS

1. Sasieni, Yaspan and Friedman, "Operation Research - Methods and Problems", John Wiley, 2004
2. Hamdy A.Taha, "Operations Research", Pearson Education, 2004.
3. Hillier & Liebermann, "Operations Research - An Introduction", Tata McGraw Hill, 2004.
4. Kalyanmoy Deb, "Optimization for Engineering Design - Algorithm and Examples", Prentice Hall of India, 2004.
5. Ravindren "Operations Research", Wiley, Second Edition, 2007.
6. Kandisawroop, Manmogan Gupta," Operations Research", Fourth Edition, 2005.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X	X						X	X				
CO 2	X	X	X	X						X	X				
CO 3	X	X	X	X						X	X				

13CS53 - COMPUTER NETWORKS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge about the Layered architecture, Protocols, Services and Standards used in computer networks. To learn the basics of socket programming.

COURSE OUTCOMES

CO1 : Ability to design and analyze the network infrastructure of an organization.

CO2 : Ability to analyze algorithms for routing and congestion control for real - time network traffic.

CO3 : Design, implement and deploy client - server based applications.

PHYSICAL AND DATA LINK LAYER

Network hardware - Network software -OSI reference model -TCP/IP model - Overview of transmission media-Guided transmission media, wireless transmission-Data link layer design issues- Error detection and correction - Sliding window protocols-Packet over SONET,ADSL. (9)

MAC SUB LAYER

Multiple access protocols: ALOHA,CSMA - Collision free and limited contention protocol -Ethernet - Token ring - Wireless LAN -Bluetooth -Data link layer switching -Virtual LAN (9)

NETWORK LAYER

Packet switching - Routing algorithms: Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing -Congestion control algorithms- Quality of service (QoS): ISA, DS, Network layer in internet: IP protocol, IP addresses, ICMP, ARP, RARP, DHCP, Label switching and MPLS. (9)

TRANSPORT LAYER

Addressing - Connection establishment and Release - Error Control and Flow Control - Multiplexing - Internet transport protocol: UDP, TCP - Application layer: DNS - E mail - Streaming audio and Video - MBone (9)

ELEMENTARY SOCKETS

Socket address structure-Byte ordering functions - Elementary TCP socket functions - Concurrent servers - Elementary UDP socket functions - Elementary SCTP sockets - Name and address conversions - Day time client/ server - echo client/ server. (9)

TOTAL : 45

TEXT BOOKS

1. Andrew S.Tanenbaum, David J. Wetherall "Computer Networks", Pearson Education, Fifth edition,2010.
2. Richard Stevens, "UNIX Network Programming, the sockets Networking API", Vol 1, Pearson education Asia, Third edition, 2004 (Chapter 3,4,8,9 - Elementary Sockets)

REFERENCE BOOKS

1. William Stallings, "Data & Computer Communications", Pearson Education, Eighth edition, 2009.
2. Behrouz A Forouzan, "Data Communication & Networks", McGraw Hill, Fifth Edition, 2013.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X			X										X	
CO 2	X			X										X	
CO 3	X			X			X							X	

13CS54 - MICROPROCESSORS AND INTERFACING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the internal architecture of microprocessors and other supporting programmable ICs. To develop assembly language programming skills and interface external hardware to microprocessor.

COURSE OUTCOMES

CO 1 : *Understanding of the internal architecture of Microprocessor.*

CO 2 : *Ability to develop assembly language programs and analyze their performance.*

CO 3 : *Ability to design interfaces for peripheral devices to microprocessors.*

CO 4 : *Analyze, design and develop microprocessor based systems for various applications.*

8085 MICROPROCESSOR

Architecture - Instruction set - Programming examples: Looping - Counting - 16 bit arithmetic - Time delays - Stack and Subroutines - code conversion - BCD arithmetic. **(10)**

SUPPORTING IC'S

Internal architecture, modes of operation and usage of 8255 Programmable Peripheral Interface, 8259 Programmable Interrupt Controller, 8253 Programmable Interval Timer, 8251 Universal Synchronous Asynchronous Receiver Transmitter **(5)**

INTERFACING

Basic interfacing concepts: Interfacing memory - Memory mapped I/O - Isolated I/O - 8085 interrupts - Interfacing applications: ADC & DAC interface, Traffic light control, Temperature control, and Stepper motor control using 8255 - Bus standards - RS 232c, USB. **(7)**

8086 MICROPROCESSOR

Intel 8086 microprocessor architecture - 8086 signals and timing -Instruction Set - TASM - linking and relocation- stacks- procedures- macros- software and hardware interrupts and Interrupt service routines - MIN/MAX mode of operation. **(12)**

PENTIUM MICROPROCESSOR

Real, Protected mode and Virtual 8086 Mode of operation of the Pentium Processor - Registers - Interrupt Processing - Features of Reduced Instruction Set Computing and Complex Instruction Set Computing. **(6)**

MULTICORE ARCHITECTURE

Superscalar - Pipelining - Branch Prediction - FPU - Paging - Multitasking Exception. Introduction to Intel i3 processor. **(5)**

TOTAL : 45

TEXT BOOKS

1. Ramesh S. Gaonkar, "Microprocessor Architecture Programming and Applications with the 8085/8080A", Penram International Publications, Fifth edition, 2002. (I & II)
2. Yu-cheng Liu and Glenn A. Gibson, "Microcomputer systems 8086/8088 Family, Architecture, programming and Design", Second Edition, 2009.(III & IV)

REFERENCE BOOKS

1. James L.Antonakos "The Intel Microprocessor Family: Hardware and Software Principles and Applications", Pearson Education, Third Edition, 2006.(V&VI)
2. John L.Hennessey and David A Patterson, " Computer architecture A Quantitative Approach" Morgan Kaufmann/ Elsevier Publishers, Fourth edition, 2007.(VI)

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X														
CO 2	X	X				X						X			
CO 3	X					X						X			
CO 4	X	X	X			X	X				X	X			

13CS55 - GRAPHICS AND MULTIMEDIA

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To learn and apply various algorithms in graphics, geometrical representations, file formats and compression techniques for multimedia transmission.

COURSE OUTCOMES

- CO1** : Analyze the importance of line drawing algorithms, circle drawing algorithms, point clipping and polygon clipping algorithms.
- CO2** : Visualize the object representations in 3D surfaces and the object transformations in 2D and 3D.
- CO3** : Analyze the importance of multidimensional index structures and various file format standards for the efficient storage representation of data in multimedia.
- CO4** : Acquire the knowledge in learning the importance of compression and the various compression techniques used for multimedia transmission.

GRAPHICS PRIMITIVES, 2D TRANSFORMATION AND VIEWING

Output primitives: points and lines - line drawing algorithms - circle and ellipse drawing algorithms - polygon generating and filling algorithms. 2D Transformations: Basic Transformations - matrix representation - translation - rotation - scaling - general pivot point rotation - general fixed point scaling - general scaling directions - reflection - shear. Viewing: window to view port co-ordinate transformation - point clipping - Cohen and Sutherland line clipping algorithm - Sutherland and Hodgeman polygon clipping algorithm. (9)

3D CONCEPTS, TRANSFORMATION AND VIEWING

3D display methods. 3D object representation: polygon surfaces - curved lines and surfaces - Quadric surfaces. Introduction to Spline Representations - Bezier curves and surfaces. 3D Transformations: Translation - Rotation - Scaling. 3D Viewing: view plane - projections - clipping. (9)

MULTIMEDIA SYSTEM DESIGN

Elements - Applications - Multimedia system architecture - Evolving technologies for Multimedia system - Defining objects - Multimedia Data Interface standards - Multimedia databases. (9)

DATA AND FILE FORMAT STANDARDS

Rich Text Format - TIFF - RIFF - MIDI - JPEG DIB - AVI Indeo File Format - MPEG Standards- TWAIN: Objectives - Architecture - New WAVE RIFF file format - PDF File Format- Multidimensional Index Structures: k-d Trees - Point QuadTree - M-X QuadTree - R Trees. (9)

COMPRESSION AND DECOMPRESSION

The Need For Data Compression - Types - Binary Image Compression Schemes - Color, Gray Scale and Still Video Image Compression -Video Image Compression - Audio Compression. (9)

TOTAL : 45

TEXT BOOKS

1. Donald Hearn and Pauline Baker M., "Computer Graphics", Prentice Hall of India, Second Edition, 2008.
2. Prabhat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", Prentice Hall of India, Reprint 2007.

REFERENCE BOOKS

1. Steve Harrington, "Computer Graphics - A Programming Approach", McGraw Hill Book Co., Second Edition, 2007.
2. John F. Koegal Buford, " Multimedia System", Pearson Education Limited, 2008.
3. K.Selcuk Candan and Maria Luisa Sapino, "Data Management for Multimedia Retrieval", Cambridge University Press, First Edition, 2010.
4. http://www.images.adobe.com/www.adobe.com/content/dam/Adobe/en/devnet/pdf/pdfs/PDF32000_2008.pdf (PDF File Format)

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X			X	X				X				
CO 2	X	X													
CO 3		X					X								
CO 4											X				

13CS56 - DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

Gain fundamental knowledge on different data models, database design, and structured query language, storage and transaction management features.

COURSE OUTCOMES

- CO 1** : *Knowledge in basic concepts and the architecture of database management systems, data models, relational database theory and the features of SQL queries.*
- CO 2** : *Master the sound design principles of logical design by using ER modeling and normalization concepts.*
- CO 3** : *Knowledge in transaction processing concepts, concurrency control mechanism and database recovery methods and the ability to apply the concepts in the design of database applications.*
- CO 4** : *Ability to use different database storage structures, access techniques and indexing methods in database applications*

INTRODUCTION TO DATA MODELS

Purpose of DBMS - Applications - Views of data - Data Abstraction - Instances and Schemas - Data Models - Database Languages - Relational Databases - Database Architecture - Database users and administrators - History of Database systems. Entity - Relationship(E-R) Model: Basic concepts - Constraints - E-R Diagram - Weak Entity Sets - Reduction of Relational schemas. Big Data - Introduction. **(9)**

RELATIONAL MODEL

Structure of Relational Databases - Relational Algebra Fundamentals - Codd's Rule- Additional and extended relational algebra operations - Null values - Modification of Database.SQL: Basic Structure - Set operations - Aggregate functions - Nested Sub queries - Complex queries - Views - Modification of the database - Integrity constraints - Referential Integrity - Triggers - Assertions - Embedded SQL. **(12)**

DATABASE DESIGN

Features of good relational design - Atomic domains and First Normal Form - Decomposition using Functional Dependencies - Functional Dependency theory - Normalization using Functional Dependencies - Decomposition using Multi-valued Dependencies. **(7)**

STORAGE

Data Capturing Technique: Bar code - QR code. RAID, Indexing and Hashing: Basic concepts - Ordered Indices - B+ tree Index Files: Structure of B+ Tree, Queries in B+ Tree, and Updates on B+ Tree. **(6)**

TRANSACTION MANAGEMENT

Transaction Concepts and States - Concurrent Executions - Serializability. Concurrency control: Lock Based Protocols: Locks, Granting of Locks, 2-phase locking protocol - Timestamp Based Protocols -

Validation based protocols - Deadlock Handling. Recovery Systems: Failure classification - Log based Recovery - Recovery with concurrent Transactions. **(11)**

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOK

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill, Sixth Edition, 2010.

REFERENCE BOOKS

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, Sixth Edition, 2010.
2. Raghu Ramakrishnan, "Database Management Systems", McGraw Hill, Fourth Edition, 2014.
3. Peter Rob and Corlos Coronel, "Database Systems: Design, Implementation and Management, "Thompson Learning Course Technology, Tenth edition, 2012.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X														
CO 2			X				X								
CO 3					X							X	X		
CO 4							X						X		

13CS61 - CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the theory of cryptography, encryption, decryption algorithms, different security issues and threats and the use of authentication methods and Intrusion Detection System.

COURSE OUTCOMES

- CO1** : *Ability to identify and analyze various security attacks and threats and use the fundamental knowledge on cryptographic theory in real world applications.*
- CO2** : *Ability in designing suitable encryption, decryption algorithms for ensuring secure communication.*
- CO3** : *Design and develop various key management and authentication techniques for trusted applications.*
- CO4** : *Selection and application of suitable intrusion detection techniques in practical applications.*

INTRODUCTION

Security Attacks - Security Services - Security Mechanisms - Basics of number theory : Modular arithmetic - Euclid Algorithm - Polynomial Fields - Classical Encryption Techniques : Symmetric Cipher Model - Substitution Techniques - Transposition Techniques. Block Cipher : Cipher Principles - Modes of Operation - Data Encryption Standard - Strength of DES - Triple DES. Advanced Encryption Standard : Evaluation criteria for AES - AES Cipher. **(12)**

PUBLIC KEY CRYPTOGRAPHY

Principles of Public key Cryptosystem - RSA Algorithm. Public Key Cryptosystems : Key Management - Diffie-Hellman Key Exchange - Elliptic Curve Arithmetic - Elliptic Curve Cryptography. **(9)**

AUTHENTICATION AND HASH FUNCTION

Authentication Requirements - Authentication Functions - Message Authentication Codes - Message Digest Algorithm (MD5) - Secure Hash Algorithm - Digital Signature Standard. **(8)**

AUTHENTICATION APPLICATIONS

Kerberos - X.509 Authentication Service - Fingerprint Authentication - Public-Key Infrastructure. Electronic Mail Security : PGP-S/MIME - IP Security - Web Security. **(8)**

INTRUSION DETECTION SYSTEM

Intruders - Intrusion detection - Password Management - Malicious Software : Viruses and Related Threats - Virus Countermeasures - Distributed DoS attacks. Firewalls : Firewall Design Principles - Trusted Systems. **(8)**

TOTAL : 45

TEXT BOOKS

1. William Stallings, "Cryptography and Network Security - Principles and Practices", Prentice Hall of India, Fifth Edition, 2010
2. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, 2012.

REFERENCE BOOKS

1. Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill, Second Edition, 2013.
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, Third Edition, 2013.
3. Wade Trappe, Lawrence C. Washington, "Introduction to Cryptography with coding theory", Pearson, Second Edition, 2011.
4. Wenbo Mao, "Modern Cryptography-Theory and Practice", Pearson Education, New Delhi, 2006.
5. Bruce Schneier, "Applied Cryptography", John Wiley and Sons, New York, 2004.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X		X										X	
CO2	X	X		X										X	
CO3	X	X	X			X						X		X	
CO4	X	X	X			X						X		X	

13CS62 - INTELLIGENT AGENTS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVES :

To understand of intelligent agent properties, agent coordination, agent negotiation, agent communication and distinction of agent from other software paradigms. Learn the basic principles, protocols and languages related to these agent issues.

COURSE OUTCOMES

- CO 1** : *Gain the concepts of AI from the perspective of intelligent agents- its knowledge and reasoning, planning in real world and learning from observation.*
- CO 2** : *Get valuable hands-on experience in developing agent systems, they are able to apply knowledge obtained during the course to design and implementation of an agent-based system.*
- CO 3** : *Ability to design and develop intelligent agent based vertical domain application for homogeneous and heterogeneous environment which is suitable for the society and to adapt the change in technology without much of architectural modification.*

INTRODUCTION

Foundation of AI - Agents and Environments - Concept of Rationality - Nature of Environments - Structure of Agents - Problem-Solving Agents and examples - Uninformed Search Strategies - Searching with Partial Information. **(8)**

SEARCH TECHNIQUES

Search Strategies: A* Search - Heuristic Functions - Local Search Algorithms and Optimization Problems - Local Search in Continuous Spaces - Online Search Agents and Unknown Environments - Constraint Satisfaction Problems - Backtracking Search for CSPs - Local Search for Constraint Satisfaction Problems - Structure of Problems - Games - Optimal Decisions in Games - Alpha-Beta Pruning. **(8)**

KNOWLEDGE AND REASONING

Knowledge-Based Agents - Logic - Propositional Logic - Reasoning Patterns - Effective propositional inference - Agents based on Propositional Logic - Syntax and Semantics of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic - Propositional vs. First-Order Inference - Unification and Lifting - Forward Chaining - Backward Chaining - Resolution - Ontological Engineering - Categories and Objects - Actions, Situations, and Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Truth Maintenance Systems. **(8)**

PLANNING

Planning Problem - Planning with State-Space Search - Partial-Order Planning - Planning Graphs - Planning with Propositional Logic - Hierarchical Task Network Planning - Planning and Acting in Nondeterministic Domains - Conditional Planning - Execution Monitoring and Replanning - Continuous Planning - Representing Knowledge in an Uncertain Domain : Bayesian Networks - Semantics of - Efficient representation of Conditional distribution - Exact inference in Bayesian networks. **(9)**

LEARNING

Forms of Learning - Inductive Learning - Learning Decision Trees - Ensemble Learning - Logical Formulation of Learning - Knowledge in Learning - Explanation-Based Learning - Learning Using Relevance Information - Inductive Logic Programming - Statistical Learning - Learning with Complete Data - EM Algorithm - Passive Reinforcement Learning - Active Reinforcement Learning. **(12)**

TOTAL : 45

TEXT BOOK

1. Stuart J Russell and Peter Norvig, "Artificial Intelligence- A Modern Approach", Pearson Education Series, Third Edition, 2009.

REFERENCE BOOKS

1. Nils J Nilsson, "Artificial Intelligence- A new synthesis", Morgan Kauffmann publishers, First Edition, 1998.
2. Thomas Dean, "Artificial Intelligence: Theory and Practices", Addison Wesley publishers, Fourth Edition, 1995.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley publishers, Third Edition, 1992.
4. Elaine Rich, Kevin Knight and Shivashankar, "Artificial Intelligence", McGraw Hill, Third Edition, 2009

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X				X					X				
CO2	X	X	X			X	X				X	X			
CO3	X	X				X					X	X			

13CS63 - DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge on various Data Mining tasks, Data Warehousing and application oriented Data Mining concepts.

COURSE OUTCOMES

CO1 : Knowledge in the basic concepts of data warehousing and data mining.

CO2 : Ability to create large multidimensional data storage and carry out OLAP operations.

CO3 : Ability to apply the concepts, algorithm, techniques and tools for developing practical applications.

DATA WAREHOUSE

Data Warehouse-Introduction-Multidimensional Data Model-Data Warehouse Architecture-Data Warehouse Implementation-From Data Warehousing to Data Mining. (7)

DATA MINING AND DATA PREPROCESSING

Data Mining-On What Kind of data-Data Mining Functionalities-Classification of Data Mining Systems-Data Mining Task Primitives-Integration of a Data Mining System with a Database or Data Warehouse System-Major Issues in Data Mining. Data Preprocessing: Needs for Preprocessing the Data - Data Cleaning- Data Integration and Transformation-Data Reduction- Discretization and Concept Hierarchy Generation. (8)

ASSOCIATION RULES

Definition-Apriori Algorithm-Partition Algorithm-Pincer Search -Dynamic Item Set Counting Algorithm-FP Tree Algorithm-Discussion on different Algorithms-Incremental Algorithm-Border Algorithm-Generation of Association Rules (10)

CLUSTERING AND CLASSIFICATION

Cluster analysis - Types of data - Categorization of major clustering methods - Partitioning - K-Means and K-Medoid algorithm - CLARA - CLARANS - Hierarchical clustering - BIRCH - Density based clustering - DBSCAN - Decision tree - Issues regarding classification and prediction - Classification by decision tree induction. (10)

MINING COMPLEX TYPES OF DATA

Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects-Mining Spatial Databases-Mining Multimedia Databases-Mining Time-Series and Sequence Data Mining-Text Databases-Mining the World Wide Web. (10)

TOTAL : 45

TEXT BOOKS

1. Jiawei Han & Micheline Kamber, "Data Mining-Concepts and Techniques" Morgan Kaufmann Publishers, Third Edition, 2012.
2. Arun K Pujari, "Data Mining Techniques" Universities Press India Ltd., Third Edition, 2012.

REFERENCE BOOKS

1. Margaret H. Dunham, "Data Mining- Introductory and Advanced Topics", Pearson Education, New Delhi, First Edition, 2006.
2. Pieter Adriaans, Dolf Zantinge, "Data Mining ", Addition Wesley, 1999. (Association Rules, Clustering and Classification)
3. San Anahory, Dennis Murray, "Data Warehousing in the Real World ", Addition Wesley, 2000.
4. George M. Marakas , " Modern Data Warehousing, Mining, & Visualization Core concepts" , Pearson Education , 2003
5. Paulraj Ponnaiah, "Data Warehousing Fundamentals", Wiley-Blackwell Publishers, Singapore, Second Edition, 2010.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X													
CO2		X			X								X		
CO3					X								X		

13CS64 - UNIX INTERNALS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge on the features of UNIX OS and its internal architecture.

COURSE OUTCOMES

CO1 : Knowledge in the concept of process management, scheduling, IPC and file management in UNIX.

CO2 : Ability to analyze the features of UNIX and Linux.

CO3 : Knowledge acquired to enhance problem solving capability.

INTRODUCTION TO KERNEL

Architecture of UNIX operating system - Introduction to system concepts - Kernel data structures. The Buffer Cache: Buffer headers - Structure of buffer pool - Scenarios for retrieval of a buffer - Reading and writing disk blocks - Advantages and disadvantages of buffer cache. **(9)**

INTERNAL REPRESENTATION OF FILES

Inodes - Structure of regular file - Directories - Conversion of pathname to an inode - Super block - Inode assignment to a new file - Allocation of disk blocks - System calls for the file system. **(9)**

STRUCTURE OF PROCESSES

Process states and transitions - Layout of system memory - The context of a process - Saving the context of a process - Manipulation of the process address space - Sleep - Process control. **(9)**

PROCESS SCHEDULING AND MEMORY MANAGEMENT POLICIES

Process Scheduling: Algorithm - Scheduling parameters - examples of process scheduling - Controlling process priorities - Fair share scheduler. Memory Management Policies: Swapping - Demand paging - A Hybrid system with swapping and demand paging. **(9)**

I/O SUB SYSTEM AND INTERPROCESS COMMUNICATION

Driver interfaces - Disk drivers - Terminal Drivers - Streams. Inter process communication: Process tracing - System V IPC - Network communication - Sockets. Case Study: Comparison of UNIX and LINUX. **(9)**

TOTAL : 45

TEXT BOOK

1. Maurice J Bach, "The Design of Unix Operating System ", Prentice Hall of India, Third Edition, 2009.

REFERENCE BOOKS

1. Uresh Vahalia, "Unix Internals: The new frontiers", Dorling Kindersley (India) Pvt Ltd, 2008.
2. John Strang, Jerry Peek, Grace Todino, "Learning the UNIX OS", O'Reily, Fifth Edition, 2002.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X										X			
CO2	X										X				
CO3		X													

13CS65 - EMBEDDED AND REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To acquire fundamental knowledge on characteristics and issues related to real time systems and embedded computing. To gain knowledge on existing real time operating systems and embedded applications.

COURSE OUTCOMES

- CO1** : *Analyze the features of existing embedded applications and real time operating systems.*
- CO2** : *Ability to design, develop and test embedded system models with integration of real time operating systems for various applications.*
- CO3** : *Ability to analyze and test real-time issues, power consumption and performance of embedded system applications.*

INTRODUCTION

Characteristics of Embedded system - Challenges in Embedded System - Embedded System Design Process - Features of 8051, ARM, PIC microcontrollers - CPU Power Consumption. **(7)**

DESIGN AND ANALYSIS

Components for embedded programs - Models of programs - Performance analysis and optimization of program size - Power analysis and optimization. **(7)**

REAL-TIME OPERATING SYSTEM

Characteristics of Real-Time Systems - Safety and Reliability - Types of Real-Time Tasks - Timing Constraints - Modeling Timing Constraints - Real Time Task Scheduling: Characteristics - Classification - Clock driven scheduling - Event driven scheduling - Hybrid schedulers - Earliest deadline first scheduling - Rate Monotonic Algorithm - Deadline Monotonic Algorithm - Self suspension with Context switching overhead - Handling Resource sharing and Dependencies among Real-time tasks. **(12)**

REAL-TIME DATABASES & NETWORKS

Characteristics of Temporal data - Concurrency Control: Locking Based Protocols, Optimistic Concurrency Control protocols - Real-Time Communications: Soft and Hard Real-Time Communication in a LAN - Bounded Access Protocol - Inter-Integrated Circuit bus - Field bus -CAN bus - Systems-on-Chip. **(9)**

DEVELOPMENT AND TESTING

Host and target machines - Tool chain for building Embedded software - In-Circuit Emulator - Logic analyzer - Testing: Fault models, Test Pattern Generation - Design for Testability: Scan design, BIST, Boundary scan - IEEE 1149 - Applications: Alarm Clock, Audio Player - CASE STUDY: VxWorks, RT Linux. **(10)**

TOTAL : 45

TEXT BOOKS

1. Marilyn Wolf, "Computers as Components: Principles of Embedded Computing System Design", Morgan Kaufman, Third Edition, 2012.
2. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education, 2009.

REFERENCE BOOKS

1. Gilmore, "Microprocessors- Principles and Applications", Tata McGraw-Hill, Second Edition, 2000.
2. David. E. Simon, "An Embedded Software Primer", Pearson Education, 2012.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X					X						X			
CO2	X	X	X			X	X				X	X			
CO3	X	X				X	X	X			X	X			

13CS66 - DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge on architecture of Distributed system, processes, communication mechanisms, naming, synchronization and Fault tolerance.

COURSE OUTCOMES

CO1 : Knowledge about the goals, principles, architecture and design issues of distributed systems.

CO2 : Ability to analyze the effectiveness and shortcomings of various solutions to the challenges faced in designing contemporary distributed systems and provide new solutions.

CO3 : Ability to understand and solve issues related to scalability, synchronization, transaction processing, concurrency and reliability in distributed applications.

CO4 : Ability to analyze and build large scale distributed applications

INTRODUCTION

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models. **(9)**

PROCESSES AND DISTRIBUTED OBJECTS

Inter process Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call. **(9)**

OPERATING SYSTEM SUPPORT AND NAMING

The OS Layer - Protection - Processes and Threads - Communication and Invocation - OS Architecture - Distributed File Systems: Introduction, File Service Architecture-Name Services: Introduction-Name Services and the domain Name System-Directory Services. **(8)**

SECURITY AND SYNCHRONISATION

Security - Overview of security techniques. Time and Global States: Introduction-Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time and Logical Clocks - Global States - Distributed Debugging. Coordination and Agreement: Introduction- Distributed Mutual Exclusion - Elections - Multicast Communication -Consensus and related problems. **(9)**

CONSISTENCY & REPLICATION

Data-centric consistency models: Continuous consistency- Consistent ordering of operations. Client-centric consistency models: Eventual consistency - Monotonic Reads - Monotonic Writes - Read your writes - Writes Follow Reads. Replica Management: Replica-Server Placement - Content Replication and Placement - Content Distribution. Consistency protocols: Continuous Consistency - Primary-Based Protocols - Replicated-Write Protocols - Cache-Coherence Protocols - Implementing Client - Centric Consistency. **(10)**

TOTAL : 45

TEXT BOOKS

1. George Coulouris, Jean Dollimore and Tim Kindberg, Gordon Blair "Distributed Systems Concepts and Design", Pearson Education, Fifth Edition, 2011.
2. Andrew S Tanenbaum, Maarten van Steen, "Distributed Systems -Principles and Paradigms", Prentice Hall, Second Edition, 2010.

REFERENCE BOOKS

1. Sape Mullender, "Distributed Systems", Addison Wesley, Second Edition, 1993.
2. Albert Fleishman, "Distributed Systems- Software Design and Implementation", Springer-Verlag, 1994
3. M.L.Liu, "Distributed Computing Principles and Applications", Pearson Education, 2004.
4. Mugesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw Hill Edition, 2001

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1		X													
CO2				X								X			
CO3								X							
CO4														X	

13CS67 - MICROPROCESSOR AND EMBEDDED SYSTEMS LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

COURSE OBJECTIVES :

To acquire practical knowledge on the internal working of microprocessors and programming using assembly language and embedded C. To understand and use embedded systems development tools and real-time operating systems.

COURSE OUTCOMES

CO 1 : *Ability to develop mixed C and assembly language programs used in embedded systems and analyze their performance.*

CO 2 : *Design and develop embedded system applications with integration of real time operating system.*

CO 3 : *Analyze and test real-time issues, performance of embedded system applications.*

ASSEMBLY LANGUAGE PROGRAMMING (8085, 8086)

1. Swapping block of data in memory
2. 8/16 bit sorting of data
3. Code conversion from one base to another
4. Multiple byte addition/ subtraction
5. 8 bit multiplication/ division
6. Simulation of Digital Clock
7. Arithmetic expression evaluation
8. String operation

INTERFACING

1. Matrix keyboard interface
2. Seven segment display interface
3. ADC & DAC interface
4. Stepper motor & DC motor interface

EMBEDDED SYSTEM

1. 8031/ PIC/ ARM Programming
2. FPGA Programming
3. Embedded C Programming
4. Timers & Interrupts
5. Real - Time Scheduling

6. Robot Programming
7. In - Circuit Emulator
8. Case Study / Design and Development of an Embedded System

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X					X						X			
CO2	X	X	X			X	X				X	X			
CO3	X	X				X	X				X	X			

13CS68 - DATA RETRIEVAL & ANALYSIS AND SOFTWARE ENGINEERING

LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

Gain practical exposure in user-oriented relational language SQL, understand and implement state-of-art techniques in data mining and software engineering principles.

COURSE OUTCOMES

CO1 : *Gain knowledge in database system architecture that covers database applications and administration through querying techniques.*

CO2 : *Ability to apply the tools and techniques of data mining in real-time applications.*

CO3 : *Acquire knowledge in design and deployment of high-quality software to satisfy end-user needs.*

DATA BASE SYSTEMS

1. Database creation, insertion and deletion.
2. Queries based on DML commands.
3. Aggregate functions.
4. Sub-queries and joins.
5. Group by clause and DATE functions.
6. Views and Triggers.
7. PL/SQL Procedures.
8. Using Cursors and functions in PL/SQL blocks

DATA ANALYSIS

1. Study of Components in SPSS Data Modeler Tool (Statistical Package for the Social Sciences)
2. Data Preparation
 - Data Exploration
 - Missing Values and Outliers
 - Data Selection, Data Cleaning, Data Normalization, Data Reduction
 - Combining Data from Multiple Sources
3. Analysis of Data
 - Association Analysis
 - Clustering
 - Classification
4. Visualization of Data

SOFTWARE ENGINEERING LABORATORY

1. Choosing Project Scenario.
2. Requirement Analysis - Using Rational Requisite Pro
3. Logical Design - Using Rational Rose
4. Testing of Errors and Memory Leaks - Using Rational Purifier
5. Test case Design - Using Rational Test Manager
6. Manual Testing and Management - Using Rational Test Manager and Quantifier
7. Automated Testing - Using Rational Robot and QTP
8. Automated Report Generation - Using Rational SODA
9. Case Study on Selenium Software Testing Tools

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X	X		X	X	X					X	X		
CO2	X	X	X			X	X						X		
CO3	X	X	X				X			X		X			

13CS69 - MINI PROJECT

L	T	P	C
0	0	3	2

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

Gain experience in developing computing applications by applying the basic knowledge acquired and to implement project ideas. Gain project management skills, technical report writing ability and team playing skills.

COURSE OUTCOMES

- CO1** : *Ability to apply computing algorithms and techniques in designing simple solutions and experience the outcome in the real time project scenario.*
- CO2** : *Working with various interdisciplinary projects to enhance the teams domain knowledge.*
- CO3** : *Develop technical skills in providing feasible solutions for real-life problems and technical writing ability.*
- CO4** : *Ability to effectively communicate and collaboratively work in peer groups.*

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1		X													
CO 2											X		X		
CO 3							X					X			X
CO 4							X	X	X						

13CS71 - INTRODUCTION TO COMPILER DESIGN

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the basic concepts of languages, their representation and the design of a compiler for any specified languages along with the text processing tool designs.

COURSE OUTCOMES

- CO1** : *Give students practical exposure to aspects of theoretical computer science including Languages, Grammars and Machines, Production Rules*
- CO2** : *Apply the ideas, the techniques and the knowledge acquired for the purpose of other software design*
- CO3** : *Know about the powerful compiler generation tools like LEX, YACC etc. which are useful to the other non-compiler applications*
- CO4** : *Working skills in theory design and application of finite state machines push down automata, conversion of grammar to machines and programs.*

INTRODUCTION

Compilers and Interpreters - The structure of a Compiler : Lexical analysis, Syntax analysis, Intermediate code generation, Code optimization, Code generation, Error handling - Phases of a compiler - Interleaving phases - Preprocessors - Compiler construction tools. **(3)**

HIGH-LEVEL PROGRAMMING LANGUAGES

Definition of Programming languages -The Lexical and Syntax structure of a language - Data environment - Parameter transmission - Storage management. **(2)**

LEXICAL ANALYSIS

Finite Automata and Lexical Analysis: The role of Lexical Analyzers, Input Buffering - A simple approach to the design of Lexical analyzer - Regular expressions - Finite automata - Regular expression to Finite Automata - Minimizing the states of a DFA - A language for specifying lexical analyzers - Implementation of a lexical analyzer. **(7)**

SYNTACTIC SPECIFICATION OF PROGRAMMING LANGUAGES

Grammar: Definition, Context sensitive, Context free, Regular grammar and Regular expression-Context Free Grammars -Derivations and Parse trees. **(4)**

BASIC PARSING TECHNIQUES

Bottom up parsing: Handle, Handle pruning - Operator precedence parsing - Simple precedence parsing- Top down parsing: Recursive descent parsing, Predictive parsers-LR parser-SLR parser-LALR parser. **(10)**

SYNTAX DIRECTED TRANSLATION

Syntax directed translation schemes- Synthesized and Inherited attributes - Implementation of syntax directed translators - Intermediate code - Postfix notation - Parse trees and Syntax trees - Three address code, Quadruples and Triples - Translation of assignment statement - Boolean expressions-Statement that alter the flow of control -Array references - Symbol tables: Contents - Structure. **(8)**

INTRODUCTION TO CODE OPTIMIZATION

The Principle Sources of Optimization -Loop Optimization - The DAG representation of Basic Blocks - Global data flow analysis - Dominators- Reducible flow graphs - Loop invariant computations - Induction variable elimination - Other loop optimizations. **(7)**

CODE GENERATION

Object programs - Issues in Code generation - A simple code generator - Register allocation and assignment - Code generation from DAG's -Peephole optimization. **(4)**

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Alfred V. Aho, Ravi Sethi, Jeffrey. D. Ullman, "Compilers Principles, Techniques and Tools", Pearson Addison Wesley, Second Edition, 2007.
2. Alfred V. Aho and Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Publishing House. Reprint 2002.

REFERENCE BOOK

1. Jean Paul Tremblay and Paul G.Sorenson., "Theory and Practice of Compiler Writing", BS Publication, Reprint 2008.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X													
CO 2	X	X									X	X			
CO 3	X						X					X			
CO 4	X	X	X			X					X			X	

13CS72 - WEB TECHNOLOGY

L	T	P	C
3	1	0	4

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge on HTML, DHTML, XML and scripting Languages, Server side technologies and E-business Models.

COURSE OUTCOMES

CO1 : Gain Knowledge in overview of WWW and web based applications.

CO2 : Ability to develop web application using ASP, JSP and PERL.

CO3 : Ability to develop Dynamic and Interactive webpage using DHTML.

CO4 : Gain Knowledge on E-business Models and E-Marketing

INTRODUCTION

Basic Web Concepts - Web based Client/Server model - Web Protocols- Working of web browser - Browser and Server Communication - History of HTML / XHTML / HTML5 - HTML5 New Features - Structural tags-Content tags - Application focused tags - Deprecated elements - HTML 5 Forms and advanced forms - DHTML - CSS - Filters and transition. **(9)**

XML

Introduction to XML - XML fundamentals - Well formed XML documents - Components of XML document - XML tools - XML Namespaces - XML Vocabularies - Document Object Model (DOM) - Simple API for XML (SAX) - Extensible Style Sheet Languages (XSL) - XML database program. **(10)**

SCRIPTING LANGUAGES

Client Side scripting - Introduction to Java Script - Arrays - Control statements - Events - Cookies - Introduction to CGI Concepts - Server Side Technologies: PERL - Arrays - Strings - Files - Database. **(9)**

SERVER SIDE TECHNOLOGIES

Java Server Pages - System Architecture - Basic JSP life cycle - JSP elements: Variables and objects - Methods - Implicit objects - Parsing Request Strings - Session Management - Java Servlets - Design-Servlet life cycle - Reading HTTP Request Headers - Writing HTTP Response Headers. **(9)**

WEB BASED APPLICATIONS AND ITS TECHNOLOGIES

Rails: Overview of Rails - Document request - Processing forms - Rails application with databases - Layouts - e-Business Models - e-Marketing - Online payments and Security. **(8)**

THEORY : 45

TUTORIAL : 15

TOTAL : 60

TEXT BOOKS

1. Deital & Deital, "Internet and World Wide Web-How to Program", Pearson Education, Fourth Edition, 2007.
2. Rashim Mogha, Preetham.V.V. "Java Web Services Programming", Wiley Dreamtech, New Delhi, 2003.

REFERENCE BOOKS

1. Robert W.Sebesta, "Programming with World Wide Web", Pearson Education, Fifth Edition,2009.
2. Scot Johnson, Keith Ballinger,Davis Howard Chapman, "Special Edition Using Active Server Pages", Prentice Hall of India, 1999.
3. Ravi Kalakota and Andrew B Whinston, "Frontiers of e-commerce", Addison Wesley, 1999.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X								X				X
CO 2	X						X								
CO 3	X						X				X				
CO 4		X			X										

13CS73 - OPEN SOURCE SYSTEMS

L	T	P	C
2	0	3	4

ASSESSMENT : THEORY & PRACTICAL

COURSE OBJECTIVE

Learn importance of FOSS and gain knowledge on Linux, different open sources non-relational data bases, Python, PERL and MDA.

COURSE OUTCOMES

- CO1** : *Students shall be able to do understand the importance of FOSS.*
- CO2** : *Ability to create and manipulate non-relational data bases.*
- CO3** : *Ability to write programs using PHP, Python and manipulate SQL data base.*
- CO4** : *Ability to configure and use Apache web services.Acquire knowledge to develop software model using MDA.*

FOSS PHILOSOPHY AND LINUX PACKAGE

Introduction to Software Terminologies - Overview of Free/Open Source Software - Definition of FOSS & GNU - History of GNU/Linux and the Free Software Movement, Advantages of Free Software and GNU/Linux, FOSS usage, trends and potential - global and Indian-Free Software Licenses(GPL, LGPL, AGPL). Installing software from source code as well as using binary packages - Understanding build systems - constructing make files and using make, using autoconf and autogen to automatically generate make files tailored for different development environments. **(6)**

OPEN SOURCE NON RELATIONAL DATABASES

NoSQL definition - relational vs non-relational database - working with NoSQL - Running MongoDB - Getting A Database Connection - Inserting Data into A Collection - Accessing Data From a Query - CouchDB- Developing with CouchDB - Example application - Deploying CouchDB. **(6)**

OPEN SOURCE PROGRAMMING LANGUAGES

PHP: Introduction - Programming in web environment - variables - constants - data types -operators - Statements - Functions - Arrays - OOP - String Manipulation and regular expression - File handling and data storage - PHP and SQL database - PHP and LDAP - PHP Connectivity - Sending and receiving E-mails - Debugging and error handling - Security - Templates. **(6)**

PYTHON

Syntax and Style - Python Objects - Numbers - Sequences - Strings - Lists and Tuples -Dictionaries - Conditionals and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OOP - Execution Environment. **(6)**

OPEN SOURCE TOOLS AND TECHNOLOGIES

Web Server: Apache Web server - Working with Web Server - Configuring and Using apache web services
MDA: Introduction to MDA - Genesis of MDA - Meta Object Facility - UML -UML Profiles - MDA Applications.

(6)

THEORY : 30

PRACTICAL : 45

TOTAL : 75

TEXT BOOKS

1. Mike Mcgrath, "Linux in easy steps", Fifth Edition, TMH Edition; 2010
2. N. B. Venkateshwarlu (Ed), "Introduction to Linux: Installation and Programming", BS Publishers; 2005. (An NRCFOSS Publication)
3. Steve Suehring, "MySql Bible", John Wiley, 2007
4. Steven Holzner, "PHP: The Complete Reference", TMH Edition, 2007
5. J.Chris Anderson, "CouchDB: Definitive Guide", First Edition, O'Reilly series.
6. Wesley J.Chun, "Core Python Programming", Prentice Hall, 2007
7. Stephen J. Mellor, Marc Balces, "Executable UMS: A foundation for MDA", Addison Wesley, 2002.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X			X								X	
CO 2	X					X	X				X	X			
CO 3	X					X	X				X	X			
CO 4		X	X		X	X						X		X	

ASSESSMENT PROCEDURE

THEORY :

Final Examination = 40%

Internal Assessment = 10%

PRACTICAL :

Continuous Assessment = 50%

13CS81 - INDUSTRIAL ECONOMICS AND CORPORATE MANAGEMENT

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To introduce to the students the basic principles governing the industrial and corporate Management and to increase corporate profitability through the use of economic analysis. To gain a basic understanding of principles of management including planning, organizing and controlling and the concepts of organisational behaviour and its application in managing people.

COURSE OUTCOMES

CO1 : *Analyze, interpret, express, and evaluate information and ideas at the collegiate level*

CO2 : *To apprehend the fundamental of economic problem like inflation & unemployment and their implication for business environment.*

CO3 : *Understand the basic operation of a modern market economy.*

ECONOMICS

Definition - Relationship between Economics and Engineering - Demand Analysis and Supply Analysis, Elasticity of Demand and Supply - Cost of Production - Break-even Analysis - Pricing under perfect competition, monopoly and monopolistic market. **(9)**

INDUSTRIAL FINANCE

The need for Finance, Types of Finance - Sources of Finance - Business cycle and Business policies- Demand Recession in India - Causes, Indicators and Prevention - Stock exchange. **(9)**

MONEY AND EMPLOYMENT

Estimation of National Income, Methods and Problems - Inflation and Deflation -Unemployment - Money and Changes in Value of Money, Commercial Banks, Central Banking - New Economic Environment - Privatization, Liberalization and Globalization - Importance of Patent Rights. **(9)**

HUMAN RESOURCE MANAGEMENT

Principles of Management, Evolution of Management, Development of Managerial Skills - Human Resource Management - Importance - Objectives - Job Analysis - Recruitment - Selection and Placement and Training Development. **(9)**

MARKETING AND INSURANCE

Marketing - Definition, Aims, Need for Marketing - Marketing function - Marketing management and its functions - Marketing versus Selling - Concept of Insurance - Life Insurance, Fire Insurance, Marine Insurance. **(9)**

TOTAL : 45

TEXT BOOK

1. Mehta P.L., “Managerial Economics - Analysis, Problems and Cases”, Sultan Chand & Sons, 2010.

REFERENCE BOOKS

1. Varshney, R.L and Maheswari, K.L, “Managerial Economics”, Sultan Chand & Sons, 2010.
2. G.S. Gupta, “Macro Economics - Theory and applications”, Tata Mc Graw Hill, 2010.
3. Philip Kotler, “Marketing Management”, Pearson Education, Thirteenth Edition.
4. R.S.N.Pillai and Bagavathi, “Marketing Management”, Sultan Chand & Sons, 2009.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X		X												
CO 2			X		X					X					
CO 3							X								X

13CS82 - VIRTUALIZATION TECHNIQUES

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the different virtualization technologies and deployment of various free open source based Virtual Machines.

COURSE OUTCOMES

CO1 : *Fundamental knowledge in Virtual Machine and its deployment techniques*

CO2 : *Recognize the different forms of virtualization and their historical roots and to understand the functionality of different virtualization products and security mechanism.*

CO3 : *Gain knowledge in different maturity levels in managing virtualization and Xen open source based implementation techniques.*

INTRODUCTION TO VIRTUAL MACHINES & INTERPRETATION AND BINARY TRANSLATION

Computer Architecture - Virtual Machine Basics - Process Virtual Machines - System Virtual Machines - Emulation: Interpretation and Binary Translation - Basic Interpretation - Threaded Interpretation - Predecoding and Direct Threaded Interpretation- Interpreting a Complex Instruction Set - Binary Translation - Code Discovery and Dynamic Translation-Control Transfer Instruction Set -Control Transfer Optimizations - Instruction Set Issues. **(10)**

PROCESS VIRTUAL MACHINES AND DYNAMIC BINARY OPTIMIZATION

Virtual Machine Implementation - Compatibility - State Mapping - Memory Architecture Emulation - Instruction Emulation -Exception Emulation - Operating System Emulation - Code Cache Management - System Environment - Case Study : FX!32 - Dynamic Binary Optimization : Dynamic Program Behavior - Profiling - Optimizing Translation Blocks - Optimization Framework - Code Reordering - Code Optimization **(8)**

HIGH LEVEL LANGUAGE MACHINE ARCHITECTURE AND IMPLEMENTATION

The Pascal P-Code Virtual Machines -Object Oriented High Level Virtual Machines - The Java Virtual Machine Architecture - Completing the Platform Architecture - Completing the Platform : APIs - The Microsoft Common Language Infrastructure : A Flexible High - Level Language Virtual Machine - Dynamic Class Loading - Implementing Security - Garbage Collection - Java Native Interface - Basic Emulation - High Performance Emulation **(10)**

CODESIGNED & SYSTEM VIRTUAL MACHINES AND MULTIPROCESSOR VIRTUALIZATION

Memory and Register State Mapping - Self Modifying and Self-Referencing Code - Support for Code Caching - Implementing Precise Traps - Input/Output - Applying Codesigned Virtual Machines - System Virtual Machines : Key Concepts - Resource Virtualization - Processors, Memory and Input/Output - Performance Enhancement of System Virtual Machines - Case Study : VMware Virtual Platform **(8)**

VIRTUAL MACHINES PRODUCTS AND EMERGING APPLICATIONS

Xen Virtual machine monitors- Xen API - VMware - VMware products - VMware Features - Microsoft Virtual Server - Features of Microsoft Virtual Server - Emerging Applications - Security - Migration of Computing Environments - Grids : Virtual Organizations (9)

TOTAL : 45

TEXT BOOK

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

REFERENCE BOOKS

1. William von Hagen, "Professional Xen Virtualization", Wrox Publications, January, 2008.
2. Kenneth Hess, Amy Newman, "Practical Virtualization Solutions: Virtualization from the Trenches", 2009
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X				X	X					X	X		
CO 2	X					X	X						X	X	
CO 3	X	X				X	X					X			

13CS83 - AD-HOC AND SENSOR NETWORKS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To acquire knowledge on mobility, reactive and proactive routing protocols, QoS and Energy Management in Ad-hoc and Sensor networks.

COURSE OUTCOMES

- CO1** : *Analyze mobility related issues to design and develop Ad-hoc and Sensor networks suitable for different applications.*
- CO2** : *Apply knowledge on QoS, Energy management aspects and related metrics for monitoring and managing various Hand-held devices.*
- CO3** : *Ability to evaluate system performance through both theoretical analysis and computer simulation using open source simulation tools.*

AD-HOC WIRELESS NETWORK

Wireless LAN: 802.11 and 802.16 architecture - Ad-Hoc wireless network: Introduction - Issues - Ad-Hoc wireless internet-MAC Protocols: Issues-Design goals-classification-contention based protocol-contention based protocol with reservation mechanisms: Distributed packet reservation multiple access protocol, collision avoidance time allocation protocol, Hop reservation multiple access protocol - MAC Protocol using directional antennas - Other MAC Protocols. **(11)**

ROUTING PROTOCOLS

Issues - Classifications - Table Driven routing protocols - On-Demand routing protocols: DSR, AODV, Location Aided Routing, Signal stability based adaptive Routing protocol - Hybrid routing protocol: ZRP-Multicast routing: Issues - Classification -Tree Based multicast routing protocols: Bandwidth - Efficient, Zone based Routing, Differential Destination - Mesh Based multicast routing protocols: Forwarding group multicast protocol, Neighbor supporting Ad-Hoc multicast routing protocol. **(9)**

TRANSPORT LAYER AND ENERGY MANAGEMENT

Issues - Design goals - Classification - TCP over Ad-Hoc wireless network- QoS frameworks: INSIGNIA, INORA, SWAN - Energy management: BAMAC, BEE Routing protocol, COMPOW **(9)**

WIRELESS SENSOR NETWORKS

Introduction - Sensor Network Architecture - Data Dissemination - Data Gathering - MAC Protocols - Location Discovery - Issues : Energy efficient design, synchronization, transport layer issues, Security, Real time communication. **(9)**

SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Tasking and control - Task driven sensing - Information based sensor tasking : IDSQ - Joint Routing and Information Aggregation - Berkeley motes - TinyOS - nesC **(7)**

TOTAL : 45

TEXT BOOKS

1. C.Siva Ram Murthy, B.S.Manoj, "Ad-Hoc Wireless Networks- Architectures and Protocols", Prentice Hall, 2012.
2. Feng ZHAO, Leonidis GUIBAS, "Wireless Sensor Networks - An Information Processing Approach", Elsevier Inc, Reprint - 2010.

REFERENCE BOOKS

1. C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2009.
2. Carlos DE Moraes Cordeiro. Dharma Prakash Agrawal, " Ad-Hoc and Sensor Networks -Theory and Applications", Second Edition, 2006

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X			X		X					X			X	
CO 2	X			X		X	X	X			X	X		X	
CO 3	X			X		X					X			X	

13CS86 - WEB PROGRAMMING AND COMPILER LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

Acquire Practical Skills in HTML, DHTML, XML and scripting languages for Web page designing. Knowledge on designing simple compiler for a given grammar using Lex and Yacc.

COURSE OUTCOMES

CO1 : Ability to design Interactive Webpages.

CO2 : Ability to design a simple compiler for a given grammar using lex and Yacc.

WEB PROGRAMMING

1. Simple web page designing.
2. Web page designing using CSS, Frames, Filters etc.,
3. Dynamic web page design using PERL script.
4. Case studies like a trading system, a portal system, a reservation system etc.,
5. Simple application using XML.

COMPILER

Programs using the following concepts on UNIX platform.

1. Lexical Analysis.
2. YACC
3. Design of a simple compiler for a given grammar.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

Course Outcomes	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1		X	X		X		X	X		X	X				
CO 2	X	X	X			X								X	

13CS87 - DISTRIBUTED COMPONENT AND NETWORKS LABORATORY

L	T	P	C
0	0	3	4

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

Ability to develop component based applications using CORBA, COM, RMI and EJB. To gain practical knowledge to design and develop client server applications using socket.

COURSE OUTCOMES

CO1 : Gain in-depth Knowledge in Distributed computing using CORBA, COM, RMI and EJB.

CO2 : Able to implement different models of servers using Socket functions.

CO3 : Gain practical knowledge in implementing various protocols of TCP/IP suite

DISTRIBUTED COMPONENT

1. Creation of COM/DCOM components with Clients (C++,VB)
2. RPC
3. Java RMI
4. CORBA/ORB
5. JavaBeans/EJB with Stateful and Stateless Beans

NETWORKS

1. TCP client server programming
2. UDP client server programming
3. Concurrent and Iterative Servers
4. Implementation of protocols (eg: ARP,RARP,DHCP)
5. I/O multiplexing
6. Client to client communication
7. Daemon Process

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X						X							X	
CO 2	X	X		X										X	
CO 3	X	X		X										X	

13CS88 - PROJECT AND VIVA - VOCE

L	T	P	C
0	0	6	6

ASSESSMENT : PRACTICAL

COURSE OBJECTIVE

Increase, develop and apply computer science and engineering knowledge and work with team members for sharing ideas and knowledge transfer. Gain project management skills and enhance the technical report writing ability. Decide and agree with peers towards a common goal and to sustain diverse acts with partners for successful completion of a project.

COURSE OUTCOMES

- CO1** : *Application of algorithm and design techniques in the project and experience their outcome in their own real time project scenario.*
- CO2** : *Enhance the management skills to achieve the project goal by working as a team and enhance technical writing skills.*
- CO3** : *Incorporating mathematical techniques in various fields for solving Computer Engineering problems.*
- CO4** : *Working with various interdisciplinary projects to enhance the teams domain knowledge.*
- CO5** : *Demonstrate the technical skills acquired to provide feasible solutions for real-life problems.*
- CO6** : *Ability to effectively communicate and collaboratively work in peer groups to develop optimized hardware / software solutions.*

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1		X		X											
CO 2							X			X					X
CO 3				X											
CO 4											X		X		
CO 5		X	X												
CO 6						X	X	X				X			

E-1 - AUTOMOTIVE ELECTRONICS - EMBEDDED SOFTWARE DEVELOPER

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge in automobile electrical and electronics, embedded software development, Embedded operating system and communication protocols in embedded system. To learn about automotive application development like functional design, auto-code generation.

COURSE OUTCOMES

CO 1 : Knowledge on basics of automotive electronics embedded software developments and embedded systems communication protocols.

CO 2 : Develop Autocode for specific automotive control application.

AUTOMOBILE ELECTRICALS AND ELECTRONICS

Basic Electrical Components in an automobile - Starting system (Battery, Ignition Switch, Solenoid, Starter, Neutral Safety Switch), Charging system (Alternator Drive Belt, Battery, Alternator, Voltage Regulator), Fuses Overview of Vehicle Electronic system - Driver - Vehicle - Environment system (Control and monitoring systems, Electronic systems of the vehicle and the environment) ECUs and vehicle subsystems - Electronic systems of Power-train subsystem, Electronic systems of Chassis subsystem, Electronic systems of Body subsystems (Comfort and Passive safety), Multimedia subsystems Automobile sensors and actuators, Engine management system, Vehicle safety systems, Environmental legislation (Pollution Norms - Euro / Bharat standards) **(9)**

AUTOMOTIVE EMBEDDED SOFTWARE DEVELOPMENT INTRODUCTION TO EMBEDDED SYSTEMS

Embedded Systems definition, Components of Embedded systems, Micro processor, Classification of Microprocessors (based on performance), Microcontrollers, Memory, Peripherals. Introduction to an embedded board (TMS470 based / ARM9 based) for hands on lab sessions (RISC processor based with standard peripheral/ interfaces and I/Os). **(8)**

OPERATING SYSTEM IN EMBEDDED ENVIRONMENT

Introduction to OS - General Purpose OS, RTOS - Kernel - Pre-emptive & Non pre-emptive, Scheduler, Interrupt - Interrupt latency and Context Switch Latency, Board Support package, Task - Multi-tasking, Task synchronization, Inter-task communication, Features of a typical embedded RTOS (μ C/OS-II). **(4)**

INTEGRATED DEVELOPMENT ENVIRONMENT IN EMBEDDED ENVIRONMENT

Integrated Development Environment (Introduction to IDE, Getting Started, Hardware / Software Configuration (Boot Service, Host - Target Interaction), Booting (IDE-Interaction, target-Agent), Reconfiguration, Managing IDE, Target Servers, Agents, Cross - Development, debugging), Introduction to an IDE for the lab board - RTOS, PC based debugger. **(8)**

EMBEDDED SYSTEM IN AUTOMOTIVE CONTEXT

Embedded systems in typical modern automobile - Distributed systems, Embedded components a) Engine Management system - Diesel / Gasoline system, Components, System architecture (H/W, S/W) b) Vehicle safety systems, c) Body electronics systems, d) Infotainment systems - Navigation, Car radio. **(4)**

EMBEDDED SYSTEM COMMUNICATION PROTOCOLS

Introduction to Control networking, Communication protocols in embedded systems SPI, I2C, USB - Vehicle communication protocols - Introduction to CAN, LIN, FLEXRAY, MOST, KWP 2000- Details of CAN **(4)**

AUTOMOTIVE APPLICATION DEVELOPMENT: FUNCTIONAL DESIGN, AUTO-CODE GENERATION

Introduction to Modeling and Simulation - ASCET, Labcar, INCA (Setup) definition support by RBEI or Matlab, Simulink, Labview (Setup 2), Autocode generation for a given automotive control application (e.g. Throttle valve control, PID simulation). **(8)**

TOTAL : 45

REFERENCE BOOKS

1. Robert Bosch, "Bosch Automotive Handbook", Bentley Publishers, Sixth Edition, 2004.
2. Joerg Schaeuffele, Thomas Zurawka, "Automotive Software Engineering - Principles, Processes, Methods and Tools ", SAE International, 2005.
3. Jean J. Labrosse, "µC/OS-II Real Time Kernel", CMP Books, 2002.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1											X	X			
CO 2		X	X			X					X	X			

E-2 - CLOUD COMPUTING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the basics of cloud computing, its architecture, technologies such as Infrastructure as a Service, Platform as a Service, Software as a Service, and Physical Systems as a Service and gain knowledge on both theoretical and practical solutions.

COURSE OUTCOMES

- CO1** : *Analyze the programming of cloud computing services to fully reveal and understand the framework behind the various services*
- CO2** : *Demonstrate how cloud computing architectures are designed*
- CO3** : *Challenges involved in adopting various cloud architectures and making informed decisions for the organizations*
- CO4** : *Design and build applications that are cloud computing ready*

CLOUD COMPUTING BASICS, BENEFITS AND LIMITATIONS

Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud, When you use cloud computing, Benefits, Limitations, Security Concerns. **(9)**

CLOUD COMPUTING TECHNOLOGY

Hardware and Infrastructure, Clients, Security, Network, Services, Platforms, Web Applications and APIs, Cloud Storage Overview. **(9)**

VIRTUALIZATION TECHNOLOGY

Virtual Machine Technology, System Virtual Machines, Virtual Machines and Elastic Computing, Virtual Machine migration, Virtualization application in Enterprises, Desktop virtualization, Server consolidation, Automating infrastructure management, pitfalls of virtualization **(9)**

SOFTWARE-AS-A-SERVICE (SAAS) AND ENTERPRISE ARCHITECTURE

Emergence of SaaS, SaaS architectures, Dev 2.0 Platforms, Cloud Computing, Enterprise Data and Processing, Enterprise Components, Application Integration and SOA, Enterprise Technical Architecture. **(9)**

MAPREDUCE AND EXTENSIONS

Parallel Computing, MapReduce Model, Parallel Efficiency and MapReduce, Relational Operations using MapReduce, Enterprise Batch Processing using MapReduce. **(9)**

TOTAL : 45

TEXT BOOKS

1. Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, "Cloud Computing - A practical Approach", TMH. (Unit-1 and Unit-2)
2. Gautam Shro, " Enterprise Cloud Computing Technology, Architecture, Applications" (E-book) (Unit-3 to Unit-5)

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X				X	X	X	X				X	X		
CO2	X				X	X	X	X					X		
CO3	X				X	X	X	X							
CO4	X	X			X	X	X	X				X			

E-3 - CUSTOMER RELATIONSHIP MANAGEMENT

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Understand the basic aspects of CRM architecture, the CRM processes, the concept of customer segmentation, customer data collection and use of CRM tools and data mining in CRM applications.

COURSE OUTCOMES

- CO1** : *Understand CRM architecture and the concepts like customer value, segmentation, acquisition and retention.*
- CO2** : *Ability to build business cases and scoring the customer value using suitable CRM process and application of data mining.*
- CO3** : *Gain knowledge on CRM process optimization and different CRM tools in the market and their use.*

INTRODUCTION

Most profitable Customer - CRM: Custom centered database, Managing campaigns, Evolution of marketing, Closed loop marketing, CRM architecture - Customer profitability - Customer acquisition - Cross selling - Customer retention - Customer segmentation. **(9)**

BUILDING THE BUSINESS CASE

Introduction - Uncovering the needs for data mining - Defining the business value - The costs - Deploying Data mining for CRM: Introduction - Define the problem - Define the user - Define the data - Scope the project - Trial - Quality assurance - Education - Launch - Continuation. **(10)**

COLLECTING CUSTOMER DATA

Introduction - Three types of customer data - Collecting customer data - Connecting customer - Customer data and privacy - Privacy and data mining - Guidelines for privacy - Legal issues associated with data mining. **(8)**

SCORING YOUR CUSTOMER

Introduction - Process - Scoring architectures and configurations - Preparing the data - Integrating scoring with other applications - Optimizing the CRM process: Introduction - Improved customer profitability through optimization - Optimized CRM - Complete loop - Optimal CRM process - Optimization techniques. **(8)**

OVERVIEW OF DATA MINING AND CRM TOOL MARKETS

Introduction - Data mining market place - Taxonomy of data mining tools - Tool assessment attributes and methodology - Tool evaluation - Other data mining tools - CRM tools - Next generation for CRM. **(10)**

TOTAL : 45

TEXT BOOK

1. Alex Berson, Stephen Smith, Kurt Thearling, "Building Data mining Applications for CRM", Tata McGraw Hill, Fourteenth Reprint, 2008.

REFERENCE BOOK

1. Francis Buttle, "Customer Relationship Management: Concepts and Technologies", Butterworth-Heinemann, Second Edition, 2009.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X				X					X					
CO 2			X		X		X			X					
CO 3			X		X		X			X					

E-4 - ENTERPRISE RESOURCE PLANNING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Acquire knowledge on the basic features, benefits and components of enterprise resource planning Software, the major functions and business modules of leading ERP packages in the industry, the selection and implementation processes in practice.

COURSE OUTCOMES

- CO1** : *Understand the core functions of ERP modules, the features and benefits of industry popular ERP packages.*
- CO2** : *Ability to analyze, understand the operational aspects and recommend suitable ERP systems meeting the needs of the organization.*
- CO3** : *Define the implementation process and strategies, coordinate with vendors and consultants and monitor the implementation.*
- CO4** : *Gain exposure to major issues and challenges in ERP implementation, Role of Internet and future directions.*

INTRODUCTION

Enterprise - An Overview - Introduction to ERP - Benefits of ERP - ERP and Related Technologies - Business Process Reengineering (BPR) - Data Warehousing - Data Mining -OLAP - SCM. **(9)**

ERP IMPLEMENTATION

ERP Implementation Lifecycle - Implementation Methodologies - ERP Implementation Strategies - Package Selection - Process Definition - Vendors and Consultants - Contract with Vendors - Consultants and Employees - Project Management and Monitoring. **(10)**

THE BUSINESS MODULES

Business modules of an ERP Package - Finance - Manufacturing - Human Resources - Plant Maintenance - Materials Management - Quality Management - Sales and Distribution. **(9)**

THE ERP MARKET

ERP Market Place - SAP AG - Peoplesoft - JD Edwards - Oracle - QAD - SSA. **(9)**

ERP - PRESENT AND FUTURE

Turbo Charge the ERP System - EAI - ERP and E-Business - ERP and Internet - Future Directions and Trends in ERP. **(8)**

TOTAL : 45

TEXT BOOK

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, New Delhi, Second Edition, 2008.

REFERENCE BOOKS

1. Ellen F.Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Course Technology Ptr, Third Edition, 2012.
2. Vinod Kumar Garg and Venkitakrishnan N.K., "Enterprise Resource Planning - Concepts and Practice", Prentice Hall of India, New Delhi, Second Edition, 2006.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1					X										
CO 2		X			X										
CO 3			X		X					X					
CO 4		X			X					X					

E-5 - GRID COMPUTING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To acquire fundamental knowledge in the area of grid computing and its applications and will have thorough understanding of the usage of grid computing tools.

COURSE OUTCOMES

CO1 : *Understand the genesis of grid computing*

CO2 : *Application of various grid computing techniques and security issues in practice*

CO3 : *Make use of the technology and tool kits to facilitate the grid computing*

INTRODUCTION TO GRID COMPUTING

Introduction - The Grid - Past, Present and Future - Applications of grid computing organizations and their roles. **(9)**

GRID COMPUTING ARCHITURE

Grid Computing anatomy - Next generation of Grid computing initiatives-Merging the Grid services architecture with Web services architecture. **(9)**

GRID COMPUTING TECHNOLOGIES

OGSA - Sample use cases that drive the OGSA platform components - OGSi and WSRF- OGSA Basic Services - Security standards for grid computing. **(9)**

GRID COMPUTING TOOL KIT

Globus Toolkit -Versions - Architecture -GT Programming model -A sample grid service implementation. **(9)**

HIGH LEVEL GRID SERVICES

High level grid services - OGSi.NET middleware Solution Mobile OGSi.NET for Grid computing on Mobile devices. **(9)**

TOTAL : 45

TEXT BOOKS

1. Joshy Joseph & Craig Fellenstein, "Grid Computing", IBM Press,2004
2. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making the Global Infrastructure a reality", John Wiley and sons,2003.

REFERENCE BOOK

1. Ahmar Abbas, "Grid Computing: A Practical Guide to Technology and Applications", Charles River media, 2003.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X		X									X		X	
CO 2		X					X							X	
CO 3	X		X			X					X		X		

E-6 - HIGH SPEED NETWORKS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To acquire fundamental knowledge on the protocols and services of High Speed LANs, Frame Relay, ISDN and ATM. To gain knowledge on QoS related services offered by various High Speed Networks.

COURSE OUTCOMES

- CO1** : Analyze various protocols and services offered by high speed networks.
- CO2** : Apply the knowledge on existing and emerging standards in High speed networks for real time communication
- CO3** : Ability to analyze QoS parameters for real time communication systems and to design and develop appropriate wired network infrastructure.

HIGH SPEED LANs and FRAME RELAY

Fast Ethernet, Gigabit Ethernet - Fibre Channel- Frame Relay: Protocols and Services, Congestion Control. **(10)**

ISDN

Overview - Interfaces and Functions - ISDN Layers: Physical, Data link, Network - Services, Signalling System Number **(12)**

B-ISDN

Standards - Services - Requirements - Architecture - Protocols: Reference Model, Physical Layer, SONET/SDH **(8)**

ATM NETWORKS

Protocol Architecture, ATM Layer, Cell Structure, Cell Header, ATM Adaptation Layer, Various types, Segmentation and Reassembly, Convergence sub-layers. **(7)**

ATM TRAFFIC AND CONGESTION CONTROL

Service Categories, Traffic Related Attributes, Traffic Management Framework, Traffic Management, ABR Traffic Management, Signaling, Protocol Signaling, Meta Signaling, TCP/IP over ATM. **(8)**

TOTAL : 45

TEXT BOOK

1. William Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM", Pearson Education, Fourth Edition, 2004.

REFERENCE BOOKS

1. Jochen Schiller, "Mobile Communication", Pearson Education Asia Ltd, Second Edition, 2008.
2. William Stallings, "High Speed Networks and Internet", Pearson Education, Second Edition, 2013.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X			X										X	
CO 2	X			X		X								X	
CO 3	X			X		X						X		X	

E-7 - HUMAN COMPUTER INTERFACE AND USABILITY ENGINEERING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Understand the design basics, paradigms, design rules, safety and social implications in the implementation of HCI support and the various aspects of usability engineering such as usability heuristics, specification, design principles and usability metrics.

COURSE OUTCOMES

- CO1** : *Ability to apply the design principles in the implementation of HCI in practice.*
- CO2** : *Ability to analyze the main features of vision / voice interface, evaluate GUI prototype and provide communication between design processes for interactive software systems.*
- CO3** : *Gain knowledge on the principles, specification and metrics of usability engineering and their application.*

INTRODUCTION

The background of HCI- The relationship of HCI to other disciplines -The importance of HCI - The role of HCI in the development of software. **(9)**

USER'S PHYSICAL AND MENTAL CAPABILITIES

Cognition - The Senses - Vision - Design Considerations - Hearing - Touch- the haptic channel - Taste and smell - An overview of memory - Memory in action - Memory experiments - Guidelines and interfaces - Memory learning - Computer- human systems. **(10)**

INTERFACE AND DESIGNING SYSTEMS FOR PEOPLE

The principles of interface design - The classification of interaction styles - Direct versus linguistic manipulation- User classification - User types - The design process - Collection of data about the system - The purpose of task analysis - Strategies for representing design. **(8)**

EVALUATION AND TESTING

The importance of evaluation - Problem areas in evaluation - Evaluation techniques - Experiments - Questionnaires- Questionnaire types- Interviews- Observation- Activity sampling and activity logging - Co-operative Evaluation-Usability Engineering - Defining objectives - Usability Engineering Life cycle - Different stages -Heuristics in Usability Engineering -Extensions to usability specification - Usability metrics - Socio- technical design- General principles for system design. **(9)**

ERGONOMICS, HEALTH AND SAFETY AND SOCIAL IMPLICATIONS

Health and safety - Postural fatigue and repetitive strain injury - Ergonomics - The office environment - The home - Society - Hypertext and web - Computer systems and law. **(9)**

TOTAL : 45

TEXT BOOKS

1. Faulkner Christine, " The Essence of Human Computer Interaction", Pearson Education, First Impression, 2011.
2. Jakob Nielson, "Usability Engineering", Morgan Kaufmann Publishers, 1992.

REFERENCE BOOKS

1. Alan Dix, Janet Finlay, G D Abowd and Russel Beale, "Human Computer Interaction", Pearson Education, 2004.
2. Ben Shneiderman, "Designing the user interface", Addison Wesley, 1998.
3. Wilbent. O. Galitz, "The Essential Guide To User Interface Design", John Wiley&Sons, 2001.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X	X				X				X				
CO2	X	X	X				X			X	X				
CO3	X				X		X			X					

E-8 - INFORMATION SECURITY

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Understand the basic principles of information security, security threats, attacks, important security technologies, tools and controls and to gain exposure to security laws, policies, standards, and industry practices for ensuring business continuity.

COURSE OUTCOMES

- CO1** : *Analyze and identify the security threats, attacks and device suitable security policies and standards.*
- CO2** : *Ability to plan, assess and device suitable risk control strategies in practice.*
- CO3** : *Ability to implement appropriate intrusion detection and prevention systems to ensure information availability.*
- CO4** : *Ability to apply various national, international laws and legal frameworks emphasizing responsibility and accountability at all levels in the organization.*

INTRODUCTION, NEED, ETHICAL AND PROFESSIONAL ISSUES

Introduction to Information Security - The History of Information Security- What is Security? Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing Components - Balancing Information Security and Access - The Systems Development Life Cycle - The Security Systems Development Life Cycle. The Need for Security: Introduction - Business Needs First -Threats - Attacks. Ethics and Information Security - Codes of Ethics and Professional Organizations - Organizational Liability and the Need for Counsel. (7)

RISK MANAGEMENT AND INFORMATION SECURITY

Introduction - An Overview of Risk Management - Risk Identification - Risk Assessment - Risk Control Strategies - Selecting a Risk Control Strategy - Risk Management Discussion Points - Documenting Results Recommended Practices in Controlling Risk. (6)

POLICIES, STANDARDS, PRACTICES AND BUSINESS CONTINUITY

Introduction - Information Security Policy, Standards and Practices -The Information Security Blueprint: ISO 17799/BS 7799, ISO 27001 and its controls, NIST Security Models, VISA International Security Model, Design of Security Architecture - Security Education, Training and Awareness Program - Continuity Strategies. (9)

SECURITY TECHNOLOGY: INTRUSION DETECTION, ACCESS CONTROL, AND SECURITY TOOLS

Introduction - Intrusion Detection and Prevention Systems: IDPS Terminology, Use of IDPS, Strengths and Limitations of IDPS - Honey Pots, Honey Nets, and Padded Cell Systems - Scanning and Analysis Tools, Access Control Devices - Physical Security - Security and Personnel. (11)

BIOMETRIC CONTROLS

Biometrics - Nature of Biometrics Identification/Authentication Techniques - Biometric Techniques - Matching and Enrollment Process in Biometrics - Benefits over Traditional Authentication Methods. (4)

SECURITY OF WIRELESS NETWORKS

Attacks on Wireless Networks: Other Security Risks in Wireless Networks, Management and Mitigations for Wireless Networks Attacks. (3)

LAWS AND LEGAL FRAMEWORK

Introduction - Information Security and the Law: The Rising Need -Understanding the Laws for Information Security: A Conceptual Framework - The Indian IT Act - Laws for Intellectual Property Rights (IPR) - Health Insurance Portability and Accountability Act (HIPAA) -Gramm-Leach-Bliley Act (GLBA) - Overview of Sarbanes-Oxley (SOX) - Building Security into Software/System Development Life Cycle. (5)

TOTAL : 45

TEXT BOOKS

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Course Technology, New Delhi, Fourth Edition, 2012 Reprint.
2. Nina Godbole, "Information Systems Security-Security Management, Metrics, Frameworks and Best Practices", Wiley India Pvt. Ltd., New Delhi, First Edition, 2009

REFERENCE BOOKS

1. Thomas R.Peltier, "Information Security Fundamentals", Auerbach Publications, Revised Second Edition, 2013.
2. Micki Krause and Harold F.Tipton, "Information Security Management Handbook", Auerbach Publications, Second Edition,2009.
3. Mark Merkow and Jim Breithaupt," Information Security - Principles & Practices", Pearson Education, 2011.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1		X	X				X							X	
CO2	X	X		X			X			X				X	
CO3	X	X		X										X	
CO4					X		X							X	

E-9 - INFORMATION STORAGE AND MANAGEMENT

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Acquire knowledge on storage system architecture, data protection requirements, storage networking technologies and virtualization concepts and to gain insight into backup, restoration and replication mechanisms for ensuring business continuity and information availability.

COURSE OUTCOMES

- CO1** : *Ability to analyze and identify the data centre needs performance requirements and its storage architecture.*
- CO2** : *Select and implement suitable Data protection and storage solutions in practical applications to ensure information availability.*
- CO3** : *Ability to deploy storage networking techniques such as DAS, SAN and NAS*
- CO4** : *Ability to plan and implement different forms of Virtualization and to use appropriate back up, restoration and replication methods to ensure business continuity*

INTRODUCTION TO STORAGE TECHNOLOGY

Information Storage - Evolution of Storage Technology and Architecture - Data Centre Infrastructure - Key challenges in Managing Information - Information Lifecycle. Storage System Architecture: Component of a Storage System Environment - Disk Drive Components and Performance - Laws Governing Disk Performance - Logical Components of Host - Application Requirement and Disk performance. **(7)**

DATA PROTECTION AND INTELLIGENT STORAGE SYSTEMS

Implementation of RAID - RAID Array Components - RAID levels - RAID Comparison - RAID impact on Disk Performance - Hot Spares - Component of an Intelligent Storage System - High - end Storage Systems - Midrange Storage System. **(6)**

DIRECT ATTACHED STORAGE AND SCSI

Directly Attached Storage and Introduction to SCSI: Types of DAS - DAS benefits and limitations - Disc Drive Interfaces - Introduction to parallel SCSI - SCSI Command Model **(4)**

SAN AND NAS

Storage Area Networks: Fibre Channel overview - The SAN and its evolution - Components of SAN - FC Connectivity - Fibre Channel Ports - Fibre Channel Architecture- Zoning - Fibre Channel Login Types - FC Topologies

Network Attached Storage: General Purpose Servers vs NAS devices - Benefits of NAS - NAS file I/O- Components of NAS - NAS Implementation - NAS File Sharing Protocols - NAS I/O operations - factors affecting NAS performance and availability. **(9)**

IP SAN, CONTENT ADDRESSED STORAGE AND STORAGE VIRTUALIZATION

IPSAN : iSCSI - FCIP - Content Addressed Storage: fixed content and archives - types of archives - features and benefits of CAS - CAS Architecture

Storage Virtualization: Overview- Forms of Virtualization- Storage Virtualization Challenges - Types of storage Virtualization. **(10)**

INFORMATION AVAILABILITY AND MONITORING

Introduction to Business Continuity - Information Availability - BC Terminology - Failure Analysis - Backup and Recovery - Backup Purpose - Backup Consideration - Backup - Granularity - Methods - Backup and Restore operations - Local Replication - source and target - uses of local replica - Data Consistency - Local Replication Technologies - Restore and Restart consideration - Creating Multiple replicas - Remote replication - Modes of remote Replication - Remote replication Technology - Network infrastructure. **(9)**

TOTAL : 45

TEXT BOOK

1. Emc² Corporation, "Information Storage and Management", Wiley, 2009.

REFERENCE BOOK

1. Robert Spalding, "Storage Network - The Complete Reference", Tata McGraw Hill, Osborne, 2003.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X						X					X		
CO 2	X	X											X		
CO 3						X					X		X	X	
CO 4	X		X		X			X			X		X	X	

E-10 - MACHINE LEARNING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the machine learning techniques - Bayesian, Decision tree, Clustering, Analytical and Instance based learning and to apply the techniques in computing.

COURSE OUTCOMES

- CO1** : *Acquire Knowledge in various learning techniques like decision tree, Bayesian, Analytical, Inductive and Reinforced learning.*
- CO2** : *Identify and apply the appropriate machine learning techniques for classification, pattern recognition, optimization and decision problems.*
- CO3** : *Development of techniques in information science applications by applying computational intelligence and appropriate machine learning techniques*

INTRODUCTION

Machine Learning - Examples of Machine Learning Applications - Learning Associations - Classification - Regression - Unsupervised Learning - Reinforcement Learning - Supervised Learning : Learning a Class from Examples - Vapnik - Chervonenkis (VC) Dimension - Probably Approximately Correct (PAC) Learning - Noise - Learning Multiple Classes - Regression - Model Selection and Generalization - Dimensions of a Supervised Machine Learning Algorithm (7)

BAYESIAN DECISION THEORY

Classification - Losses and Risks - Discriminant Functions - Utility Theory - Value of Information - Bayesian Networks - Influence Diagrams - Association Rules - Parametric Methods : Introduction - Maximum Likelihood Estimation - Evaluating an Estimator: Bias and Variance - The Bayes' Estimator - Parametric Classification - Regression (6)

MULTIVARIATE METHODS

Multivariate Data - Parameter Estimation - Estimation of Missing Values - Multivariate Normal Distribution - Multivariate Classification - Tuning - Complexity - Discrete Features - Multivariate Regression (5)

CLUSTERING

Mixture Densities - k-Means Clustering - Expectation-Maximization Algorithm - Mixtures of Latent Variable Models - Supervised Learning after Clustering - Hierarchical Clustering - Choosing the Number of Clusters (5)

DECISION TREES

Univariate Trees - Pruning - Rule Extraction from Trees - Learning Rules from Data - Multivariate Trees - Linear Discrimination : Introduction - Generalizing the Linear Model - Geometry of the Linear Discriminant - Pairwise Separation - Parametric Discrimination Revisited Gradient Descent - Logistic Discrimination - Discrimination by Regression - Support Vector Machines (7)

MULTILAYER PERCEPTRONS

The Perceptron - Training a Perceptron - Learning Boolean Functions - Multilayer Perceptrons - MLP as a Universal Approximator - Backpropagation Algorithm - Training Procedures - Tuning the Network Size Bayesian View of Learning (6)

HIDDEN MARKOV MODELS

Discrete Markov Processes - Hidden Markov Models - Three Basic Problems of HMMs - Evaluation Problem - Finding the State Sequence - Learning Model Parameters - Continuous Observations - The HMM with Input - Model Selection in HMM (5)

REINFORCEMENT LEARNING

Single State Case: K-Armed Bandit - Elements of Reinforcement Learning - Model-Based Learning - Temporal Difference Learning - Generalization - Partially Observable States (4)

TOTAL : 45

TEXT BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press, October 2004.
2. Tom Mitchell, "Machine Learning", McGraw, 1997.

REFERENCE BOOKS

1. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", Chapman & Hall/CRC 2009.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press (MA) 2012.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X			X	X							X		
CO 2		X				X					X				
CO 3	X				X		X								

E-11 - MOBILE COMPUTING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the fundamentals of mobile communication technologies and standards. To acquire knowledge on mobile operating systems and develop mobile programming skillset.

COURSE OUTCOMES

CO1 : *Ability to analyze existing and emerging mobile communication standards.*

CO2 : *Ability to analyze issues and services related to mobile computing.*

CO3 : *Apply knowledge gained in Mobile OS architecture and mobile programming to design and develop simple mobile applications*

INTRODUCTION

Mobile Communication - Mobile Computing - Mobile Computing Architecture - Mobile Devices - Mobile System Networks - Data Dissemination - Mobility Management - Security - Introduction to Cellular Systems - Global System for Mobile Communication -General Packet Radio Services and their architectures. **(9)**

MOBILE IP NETWORK LAYER

Mobile IP overview - IP packet delivery - Agent Discovery registration - Tunneling and Encapsulation - Route optimization - Reverse Tunneling - IPV6 - IP Micro Mobility Support - Dynamic Host Configuration Protocol. **(9)**

MOBILE TRANSPORT AND APPLICATION LAYER

Mobile TCP - Fast Retransmit / Fast Recovery - Transmission Timeout Freezing - Selective Retransmission - Transaction oriented TCP - TCP over 2.5/3G Wireless Networks. WAP Architecture, Datagram Protocol, Transport Security, Transaction Protocol, Session Protocol - Application Environment - WML - WML Script - Wireless Telephony Application. **(9)**

DATA DISSEMINATION AND SYNCHRONIZATOIN

Data Delivery Mechanisms - Synchronization - Synchronization Software - Synchronization Protocol- SyncML - Synchronized Multimedia Markup Language (SMIL). **(9)**

MOBILE APPLICATION DEVELOPMENT

Features of Palm OS, Symbian OS, Android OS. Development framework - Developing application for android - Development tools - Application Lifecycle - Externalizing Resources - Application class - Android activities. **(9)**

TOTAL : 45

TEXT BOOKS

1. Raj Kamal, "Mobile Computing", Oxford University Press, New Delhi, 2011. (Introduction, Data dissemination and synchronization))
2. Jochen Schiller, "Mobile Communications " Pearson Education India, Second Edition, 2008. (Mobile IP Network layer, Mobile transport and application layer)

REFERENCE BOOKS

1. Reto Meier, " Professional Android 2 Application Development", Wiley India Pvt Ltd, 2011. (Mobile Application development).
2. Stojmenovic and Cacute, " HandBook of Wireless Networks and Mobile Computing", Wiley, 2006.
3. Reza Behravanfar, " Mobile Computing Principles: Designing and Developing Mobile Applications with UML & XML", Cambridge University Press, 2014.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X			X		X								X	
CO 2	X			X										X	
CO 3	X			X		X	X				X			X	

E-12 - ROBOTICS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain knowledge about the mathematical grounds beneath rigid motions, rotations and homogenous transformation. To understand about motion trajectories and learn about robot sensing & vision and robot programming.

COURSE OUTCOMES

- CO1** : Ability to analyze the kinematics of robots and problems involving motion trajectory generations
- CO2** : Apply the knowledge gained in robot intelligence, vision & sensing and programming to design and build intelligence into robots.
- CO3** : Apply the knowledge of robot components and task planning to design and develop intelligent robots for various applications

INTRODUCTION

Brief history of robotics - Degrees of freedom - robot geometrical configurations. **(3)**

ROBOT KINEMATICS

Direct Kinematics problem: Composite Rotation Matrix, Euler Angles Representation, Geometric Interpretation - Homogeneous coordinates and transformation matrix, Geometric Interpretation of Homogeneous Transformation Matrices - Composite Homogeneous Transformation Matrix - Links, Joints and their parameters - Denavit-Hartenberg representation - Kinematic Equations for manipulators, Other specifications of the location of the End-Effector - Inverse Kinematics problem: Euler Angles Solution. **(12)**

PLANNING OF MANIPULATOR TRAJECTORIES

General considerations - Joint-Interpolated Trajectories: 4-3-4 trajectory, 3-5-3 trajectory, 5-Cubic trajectory - Planning of Cartesian path trajectories: Homogeneous transformation matrix approach, Planning straight-line trajectories using quaternions, Cubic polynomial joint trajectories with torque constraint. **(9)**

ROBOT SENSING

Categories of sensors in robots - Range sensing: Triangulation, Structured Lighting Approach, Time-of-Flight Range Finders - Proximity Sensing: Inductive sensors, Hall-effect sensors, Capacitive sensors, Ultrasonic sensors, Optical Proximity sensors - Touch sensors: Binary sensors, Analog sensors - Force and Torque sensing: Elements of wrist sensor, Resolving forces and moments - sensor calibration. **(6)**

ROBOT VISION

Imaging geometry - perspective transformations - camera model - camera calibration - stereo imaging - basic relationship between pixels - preprocessing - smoothing - enhancement - edge detection - thresholding - segmentation - use of motion - Description - Recognition. **(6)**

ROBOT PROGRAMMING LANGUAGES

Characteristics of robot-level languages: Position specification, Motion specification, sensing and flow of control, programming support - Characteristics of task-level languages: world modeling, task specification, robot program synthesis. (5)

TASK PLANNING

Modeling, Task specification, Manipulator program synthesis - Basic problems in task planning: Symbolic spatial relationships, Obstacle avoidance, Grasp planning. (4)

TOTAL : 45

TEXTBOOK

1. K.S.Fu, R.C.Gonzalez, C.S.G.Lee, "Robotics - Control, Sensing, Vision and Intelligence", Tata McGraw Hill, 2008.

REFERENCE BOOK

1. R.K. Mittal, I.J. Nagrath, "Robotics and Control", Tata McGraw Hill, 2007.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X					X									
CO2	X					X	X				X				
CO3	X					X	X				X	X			

E-13 - SERVICE ORIENTED ARCHITECTURE AND WEB SERVICES

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the fundamentals of web services and their internal architecture. To gain knowledge in SOA delivery strategies and service modeling.

COURSE OUTCOMES

CO1 : *Ability to understand the fundamentals of web services and their internal architecture.*

CO2 : *Ability to build SOA.*

CO3 : *Ability to design and implement business logic for real time systems.*

SOA AND WEB SERVICES FUNDAMENTALS

Introducing SOA: Fundamental SOA - Common characteristics of contemporary SOA - Common misperceptions about SOA - Common tangible benefits of SOA - Common pitfalls of adopting SOA. Evolution of SOA: SOA timeline - Continuing evolution of SOA - The roots of SOA. Web Services and Primitive SOA: The Web services framework - Services (as Web services) - Service descriptions (with WSDL) - Messaging (with SOAP). **(9)**

BUILDING SOA (PLANNING & ANALYSIS)

SOA Delivery Strategies: SOA delivery lifecycle phases - The top-down strategy - The bottom-up strategy - The agile strategy. Service Oriented Analysis: Introduction to service oriented analysis - Benefits of business centric SOA - deriving business services - Service modeling - Service modeling guidelines - classifying service model logic - contrasting service modeling approaches. **(9)**

BUILDING SOA (TECHNOLOGY & DESIGN)

Service Oriented Design: Introduction to service oriented design - WSDL related XML schema language basics - WSDL language basics - SOAP language basics - service interface design tools - SOA Composition Guidelines: Steps to composing SOA - considerations for choosing service layers - considerations for positioning core SOA standards - considerations for choosing SOA extensions - Service Design - Business Process Design. **(9)**

ADVANCED WEB SERVICES TECHNOLOGIES AND STANDARDS

Conversations overview - Web Services Conversation Language(WSCCL) - WSCCL interface components - Relationship between WSCCL and WSDL - Workflow - Business Process Management - Workflows and work flow management system - BPEL - ACID Transactions - Scaling Transactions to web services - Other web services Transaction Protocols. **(9)**

SECURITY IN WEB SERVICES

Web service security issues - Types of security attacks and threads - web services security roadmap - WS-security - Quality of service(QoS)Overview - QoS metrics for web services - Holes - Design patterns and Best Practices - Building QoS into Web Services and Applications - QoS Enabled Web services - QoS Enabled Applications. **(9)**

TOTAL : 45

TEXT BOOKS

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology and Design", Prentice Hall of India, First Edition, 2005.
2. Sandeep Chatterjee, "Developing Enterprise Web services, An architect's Guide", Pearson Education, First Edition 2004.

REFERENCE BOOKS

1. Dirk Krafzig, Karl Banke, Dirk Salma, "Enterprise SOA: Service- Oriented Architecture Best Practices", Pearson Education, First Edition, 2004.
2. Thomas Erl, "SOA Principles of Service Design", Prentice Hall of India, First Edition, 2007.
3. Frank P.Coyle, "XML,Web services and the Data Revolution". Pearson Education, First Edition, 2002.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X		X												
CO2	X														
CO3	X		X		X	X						X			

E-14 - SEMANTIC WEB

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain Knowledge in RDF, Ontology and its applications.

COURSE OUTCOMES

CO1 : *Understand the need and importance of Semantic web over traditional World Wide Web (WWW).*

CO2 : *Analyze the importance of RDF and its schema.*

CO3 : *Apply the associated ontology in Web Mining to provide efficient Web results.*

INTRODUCTION

Today's Web - Transformation from Today's Web to the Semantic Web - Semantic Web Technologies - A Layered Approach - XML: Structuring - Namespaces - Addressing & Querying - Processing. **(8)**

RDF

Basic ideas behind RDF - XML-based Syntax - RDF Relationship: Reification, Container and Collaboration - RDF Schema - Editing, Parsing and Processing RDF / XML - RQL - RDQL. **(9)**

ONTOLOGY

Introduction - OWL and RDF / RDFS - Three Sublanguages of OWL - Description of the OWL Language - Layering of OWL - Examples - OWL in OWL. **(10)**

LOGIC AND INFERENCE RULES

Monotonic Rules - Relationships - Syntax - Semantics - Description Logic Programs (DLP) - SWRL - NonMonotonic Rules - Motivation and Syntax - Examples - Rule Markup Language(RuleML). **(10)**

APPLICATIONS

Sample Ontology - e-Learning - Web Services - Commercial uses of RDF - Data Integration - Future of Semantic Web - Application of Semantic Techniques in Web Mining. **(8)**

TOTAL : 45

TEXT BOOK

1. Grigoris Antoniou and Frank van Harmelen, "A Semantic Web Primer", Second Edition, MIT Press, 2008.

REFERENCE BOOKS

1. Rajendra Akerkar, "Foundation of the Semantic Web: XML, RDF and Ontology", Alpha Science International Ltd., 2009.

2. Karin K.Breitman, Marco Antonio Casanova and Walter Truszkowski, "Semantic Web: Concepts, Technologies and Applications", Springer-Verlog London Ltd., 2007.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X	X	X		X	X						X		
CO2	X	X	X	X	X	X	X						X		
CO3	X	X	X	X		X	X						X		

E-15 - SOFT COMPUTING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Gain basic knowledge in fuzzy sets and neural networks and their application in neuro- fuzzy modeling and get exposed to the basics of genetic algorithms and its application in function maximization and word matching problems.

COURSE OUTCOMES

CO1 : *Knowledge in the basic concepts of fuzzy sets, neural networks and genetic algorithms.*

CO2 : *Ability to develop neuro-fuzzy systems using different modeling and algorithms.*

CO3 : *Ability to apply evolutionary algorithms to provide optimal solutions for various real world problems.*

FUZZY SET THEORY

Introduction to Neuro-Fuzzy and Soft Computing - Fuzzy Sets - Basic Definition and Terminology - Set-theoretic Operations - Member Function Formulation and Parameterization - Fuzzy Rules and Fuzzy Reasoning - Extension Principle and Fuzzy Relations - Fuzzy If-Then Rules - Fuzzy Reasoning - Fuzzy Inference Systems - Mamdani Fuzzy Models - Sugeno Fuzzy Models - Tsukamoto Fuzzy Models - Defuzzification strategies. **(10)**

SUPERVISED LEARNING NEURAL NETWORKS

Introduction- Single layer and Multi layer Perceptrons- Back propagation networks - Adaline -Madaline- Radial Basis Function Networks -Modular Networks.Self supervised Learning- Adaptive Resonance Technique. **(9)**

UNSUPERVISED LEARNING NEURAL NETWORK

Unsupervised Learning Neural Networks - Competitive Learning Networks - Kohonen Self-Organizing Networks - Learning Vector Quantization - Hebbian Learning -Principal Component Networks - The Hopfield Network. **(9)**

NEURO FUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems - Architecture - Hybrid Learning Algorithm - Learning Methods that Cross-fertilize ANFIS and RBFN - Coactive Neuro Fuzzy Modeling - Framework- Neuron Functions for Adaptive Networks - Neuro Fuzzy Spectrum. **(8)**

HEURISTIC ALGORITHMS

Genetic Algorithm-Particle Swarm Optimization- Tabu search-Simulated Unhealing. **(9)**

TOTAL : 45

TEXT BOOKS

1. Jang J.S.R., Sun C.T., and Mizutani E., "Neuro-Fuzzy and Soft Computing", Prentice Hall, First Edition, 2006.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, First Edition, 2002.

REFERENCE BOOKS

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", Wiley, Third Edition, 2010.
2. Laurene Fausett, "Fundamentals of Neural Networks, Architectures, Algorithms and Applications", Pearson Education, First Edition, 2008.
3. Eberhart R., Simpson P., and Dobbins R., "Computational Intelligence - Concepts to Implementations", Morgan Kaufmann, First Edition, 2007.
4. Vijayalakshmi Pai and Rajshekaran, "Neural networks, Fuzzy Logic and Genetic algorithms-Synthesis and Applications", Prentice Hall of India, First Edition, 2006.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X					X						X			
CO2		X											X		
CO3		X									X		X		

E-16 - SOFTWARE AGENTS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Knowledge about the basic concepts of intelligent agents, Mobile agents, agent security and simple construction tools.

COURSE OUTCOMES

CO 1 : *Analyze the various interaction protocols and communication languages which leads to develop secure agent communication.*

CO 2 : *Acquire Knowledge about various interaction protocols and communication languages.*

CO 3 : *Design and develop agent based applications.*

AGENTS - OVERVIEW

Agent Definition - Agent Programming Paradigms - Agent Vs Object - Abstract and concrete Architectures for Intelligent Agents - Mobile Agents. (9)

MULTIAGENT SYSTEMS AND SOCIETIES OF AGENTS

Introduction - Agent Communications - Agent Interaction Protocols - Societies of Agents - Learning: Introduction - Learning and Activity Coordination - Learning about and from other Agents - Learning and Communication. (9)

AGENT COMMUNICATION LANGUAGES

Agent Knowledge representation - KQML - KIF - Agent adaptability - Belief Desire Intention - BDI Architecture. (9)

AGENTS AND SECURITY

Agent Security Issues - Mobile Agents Security - Protecting Agents against malicious hosts - Untrusted Agent - Black Box Security - Authentication for agents - Security issues. (9)

AGENT CONSTRUCTION

Mobile agent with java: Agent characteristics of java - Aglet model - Aglet package - Anatomy of an Agent - Agent Design Pattern: classification - Master Slave Pattern - Itinerary pattern. (9)

TOTAL : 45

TEXT BOOKS

1. Gerhard Weiss, "Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence", MIT Press, USA, 2012.
2. Bradshaw, "Software Agents", MIT Press, USA, 2010.

- Mitsuru Oshima, "Programming and Deploying Java Mobile Agents with Aglets", Addison-Wesley, USA, 1998

REFERENCE BOOKS

- Richard Murch and Tony Johnson, "Intelligent Software Agents", Prentice Hall, USA, 2000.
- Russel and Norvig, "Artificial Intelligence: a Modern Approach", Prentice Hall, USA, 2009.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X				X	X								X	
CO2	X			X			X				X			X	
CO3	X		X	X		X	X							X	

E-17 - SPEECH AND LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand computational principles required for transforming speech or text into more formal representations that make computers to understand, identify the intended semantics, check for syntaxes and learn from statistical inference in an easier way.

COURSE OUTCOMES

- CO1** : *Gain knowledge in the computational principles underlying speech and language processing and a variety of its applications.*
- CO2** : *Capable to analyze linguistic content of speech signals.*
- CO3** : *Analyze state-of-art techniques in speech recognition, language generation and conversations that involve dialogues.*
- CO4** : *Acquire knowledge about speech and language technology and develop skills needed to address current issues.*

INTRODUCTION

Words and Transducers - Finite-State Morphological Parsing - Construction of a Finite-State Lexicon - Finite-State Transducers - FSTs for Morphological Parsing - Transducers and Orthographic Rules - The Combination of an FST Lexicon and Rules - Lexicon-Free FSTs: The Porter Stemmer - Word and Sentence Tokenization **(9)**

N-GRAMS, PART-OF-SPEECH TAGGING AND ENTROPY MODELS

N-grams - Training and Test Sets - Evaluating N-grams: Perplexity - Smoothing - Interpolation - Backoff - Part-of-Speech Tagging - English Word Classes - Tagsets for English - Part-of-Speech Tagging - Rule-Based Part-of-Speech Tagging - HMM Part-of-Speech Tagging - Transformation-Based Tagging - Hidden Markov and Maximum Entropy Models - Markov Chains - The Hidden Markov Model - Likelihood Computation: The Forward Algorithm - Decoding: The Viterbi Algorithm - HMM Training: The Forward-Backward Algorithm. **(9)**

PHONETICS, SPEECH SYNTHESIS AND AUTOMATIC SPEECH RECOGNITION

Phonetics - Speech Sounds and Phonetic Transcription - Articulatory Phonetics - Phonological Categories and Pronunciation Variation - Acoustic Phonetics and Signals - Phonetic Resources - Speech Synthesis - Text Normalization - Phonetic Analysis - Prosodic Analysis - Automatic Speech Recognition - Speech Recognition Architecture - Applying the Hidden Markov Model to Speech - Feature Extraction: MFCC vectors - Acoustic Likelihood Computation - The Lexicon and Language Model - Search and Decoding - Embedded Training - Evaluation: Word Error Rate **(9)**

SYNTAX AND FEATURES AND UNIFICATION

Syntax - Grammar Rules for English - Treebanks - Grammar Equivalence and Normal Form - Probabilistic Context-Free Grammars - CYK Algorithm - Dependency Grammars - Spoken Language Syntax - Grammars

and Human Processing - Features and Unification - Feature Structures - Unification of Feature Structures
 - Feature Structures in the Grammar - Implementation of Unification - Parsing with Unification Constraints
 - Types and Inheritance **(9)**

COMPUTATIONAL SEMANTICS AND LEXICAL SEMANTICS

Computational Semantics - Syntax-Driven Semantic Analysis - Semantic Augmentations to Syntactic Rules - Quantifier Scope Ambiguity and Underspecification - Unification-Based Approaches to Semantic Analysis - Integration of Semantics into the Earley Parser - Idioms and Compositionality - Lexical Semantics
 - Word Senses - Relations Between Senses - WordNet: A Database of Lexical Relations - Event Participants
 - Primitive Decomposition - Advanced: Metaphor. **(9)**

TOTAL : 45

TEXT BOOK

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Edition Asia, Second Edition, Sixth Impression, 2011.

REFERENCE BOOKS

1. Christopher D. Manning and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 2003.
2. Lawrence Rabiner, Biing-Huang Juang and B.Yegnanarayana, "Fundamentals of Speech Recognition", Pearson Education, South Asia, First Impression, 2009.
3. Childers D.G., "Speech Processing and Synthesis Toolboxes", John Wiley, 2000.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X	X			X	X				X		X		
CO2	X	X	X			X	X				X		X		
CO3	X	X	X			X	X				X		X		
CO4	X	X	X			X	X				X	X	X		

E-18 - USER INTERFACE DESIGN

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Knowledge on the various user interfaces, their characteristics, controls, their design issues and evaluation of user interfaces.

COURSE OUTCOMES

CO1 : *Ability to understand the elements of human-computer interaction and ability to evaluate different user interface designs*

CO2 : *Ability to design device, screen-based controls and menus*

INTRODUCTION

Human-Computer Interface - Characteristics of Graphics Interface - Direct Manipulation Graphical System - Web User Interface - Popularity - Characteristic & Principles. **(8)**

HUMAN-COMPUTER INTERACTION

User Interface Design Process - Obstacles -Usability -Human Characteristics In Design - Human Interaction Speed - Business Functions - Requirement Analysis - Direct - Indirect Methods - Basic Business Functions - Design Standards - General Design Principles - Conceptual Model Design - Conceptual Model Mock-Ups. **(7)**

WINDOWS

Characteristics - Components - Presentation Styles - Types - Managements - Organizations - Operations - Web Systems - System Timings - Device-based controls - Screen-based controls - Human Consideration in Screen Design - Structures of Menus - Functions of Menus - Contents of Menu - Formatting - Phrasing The Menu - Selecting Menu Choice - Navigating Menus - Graphical Menus. Operate Control - Text Boxes- Selection Control - Combination Control - Custom Control - Presentation Control. **(12)**

MULTIMEDIA

Text For Web Pages - Effective Feedback - Guidance & Assistance - Internationalization - Accessibility - Icons - Image - Multimedia - Coloring. **(9)**

EVALUATION

Conceptual Model Evaluation - Design Standards Evaluation - Detailed User Interface Design Evaluation **(9)**

TOTAL : 45

TEXT BOOKS

1. Wilbent. O. Galitz, "The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques", Third Edition, John Wiley& Sons, 2007.

2. Ben Shneiderman and Catherine Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", Fifth Edition, Addison-Wesley Publ. Co., 2010.
3. Deborah Mayhew, "The Usability Engineering Lifecycle: A Practitioner's Handbook for User Interface Design", Morgan Kaufmann, 1999

REFERENCE BOOK

1. Alan Dix, Janet Finlay, G D Abowd and Russel Beale, "Human Computer Interaction", Pearson Education, 2004.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X				X			X	X				
CO 2	X	X	X								X	X			

E-19 - VLSI DESIGN

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To understand the basics of CMOS Technology and back-end process for design and implementation of CMOS devices and logic circuits. To understand clocking strategies and distribution techniques, programmable logic devices, testing and fault analysis in VLSI circuits. To gain knowledge about designing VLSI circuits using verilog HDL.

COURSE OUTCOMES

- CO 1 :** *Understand the basics of CMOS Technology and back-end process for design and implementation of CMOS devices and logic circuits.*
- CO 2 :** *Gain the knowledge about clocking strategies and distribution techniques in VLSI circuits.*
- CO 3 :** *Analyze the design procedures for CMOS Sub-systems, memories and gain knowledge about programmable logic devices and CMOS testing.*
- CO 4 :** *Identify, formulate, analyze and solve design problems using Verilog HDL.*

INTRODUCTION TO CMOS CIRCUITS AND PROCESSING TECHNOLOGY

VLSI Design flow - Logic Design with MOSFETs: MOSFETs as Switches, Basic Logic Gates in CMOS, Complex Logic Gates in CMOS, Transmission Gate Circuits - CMOS Layers - Designing FET arrays - Electrical Characteristics of MOSFETs: nFET Current Voltage Equations, FET RC Model, pFET characteristics - n-well CMOS Fabrication and Layout Design Rules. **(9)**

CMOS LOGIC CIRCUIT DESIGN

DC and Switching Characteristics of CMOS inverter, Ring Oscillator - NAND and NOR Gates - Power Dissipation - Analysis of Complex Logic Gates - Gate design for transient performance - Transmission Gates and Pass Transistors - Pseudo nMOS - Tri state Circuits - Clocked CMOS - Dynamic CMOS Logic Circuits - CMOS Clocking Styles - Clock Generation and Distribution. **(9)**

CMOS SUB SYSTEM DESIGN AND SPECIAL PURPOSE CIRCUITS

Bit Adder Circuits - Ripple Carry Adders - Carry Look Ahead Adders - Comparator - unsigned Array Multiplier - Serial Division - Latches - D Flip flops - Registers - Synchronous and Asynchronous Counters - Special Purpose Circuits: Schmitt Trigger, Multivibrators, Digital Phase Locked Loops. **(9)**

MEMORIES, PROGRAMMABLE LOGIC AND CMOS TESTING

Memory Elements: SRAM - DRAM - ROM - Programmable Logic Devices - CPLD - FPGA - Xilinx architecture - Manufacturing test principles: Fault Models, Observability, Controllability, Fault Coverage, Automatic Test Pattern Generation (ATPG) - Design for Testability: Built in Self Test (BIST), IDDQ Testing - Boundary Scan Test. **(9)**

VERILOG HDL

Hierarchical Modeling Concepts - Basic Constructs and Conventions in Verilog - Modules and Ports - Gate Level Modeling - Dataflow Modeling - Behavioral Modeling - Tasks and Functions. **(9)**

TOTAL : 45

TEXT BOOKS

1. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons, 2009.
2. Neil H.E. Weste, David Harris and Ayan Banerjee, "CMOS VLSI Design - A Circuits and Systems Perspective", Pearson Education, Third Edition, 2009.

REFERENCE BOOKS

1. Samir Palnitkar, "VERILOG HDL - A Guide to Digital Design and Synthesis", Pearson Education, Second Edition, 2011.
2. R. Jacob Baker, Harry W. Li, David E. Boyce, "CMOS Circuit Design, Layout and Simulation", John Wiley & Sons, Third Edition, 2011.
3. Wayne Wolf, "Modern VLSI Design", Pearson Education Asia Pvt. Ltd, Fourth Edition, 2009.
4. A. Pucknell, Kamran Eshraghian, "Basic VLSI Design", Prentice Hall of India, Third edition, 2007.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	X	X				X	X								
CO2	X	X				X									
CO3	X	X	X	X	X	X	X				X	X		X	
CO4	X	X	X			X	X				X	X		X	

E-20 - BIOINFORMATICS

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To gain Knowledge in the basic aspects of the biological patterns, information retrieval strategies, sequence alignments and the issues in proteins & drug discovery.

COURSE OUTCOMES

CO1 : *Knowledge in the basics of biological patterns, information retrieval strategies, and pattern recognition and sequence alignments.*

CO2 : *Ability to analyze and solve the issues related to proteomics and drug discovery*

CO3 : *Ability to apply engineering and Bio-informatics concepts to solve problems in Bio-technology domain.*

INTRODUCTION

Life in Space and Time - Dogmas - Data Archives - WWW - Biological Classification - Use of Sequences to determine phylogenetic relationships - Searching for similar sequences in databases - Introduction to protein structure - Protein Structure prediction and engineering - Clinical Implications. **(9)**

GENOME ORGANIZATION AND EVOLUTION

Genomics and Proteomics - Eavesdropping on transmission of genetic information - Picking out genes in genomes - Genomes of prokaryotes - Genomes of Eukaryotes - Human Genome - Evolution of Genomes. **(9)**

ARCHIVES AND INFORMATION RETRIEVAL

Data base indexing and specification of search terms - Follow -up questions, analysis of retrieved data - archives - Gateways to Archives: Access to database in molecular biology - ENTREZ - SRS - PIR - ExPASy, Ensembl. **(7)**

ALIGNMENTS AND PHYLOGENETIC TREES

Introduction to Sequence Alignment - The dotplot - Dotplots and Sequence Alignments - Measures of Sequence similarity - Computing the Alignment of two sequences - The dynamic programming algorithm Signature of alignments - Multiple sequence alignment - Applications - Phylogeny - Phylogenetic trees. **(10)**

PROTEIN STRUCTURE AND DRUG DISCOVERY

Protein Stability and Folding - Applications of Hydrophobicity - Superposition of structures - DALI - Evolution of Protein Structures - Classification of Protein Structures - Protein Structure prediction and modeling - Assignment of protein structures to genomes - Prediction of protein function - Drug discovery and development. **(10)**

TOTAL : 45

TEXT BOOK

1. Arthur M Lesk, "Introduction to Bioinformatics", Oxford University Press, India, Third Edition, 2008.

REFERENCE BOOKS

1. Affward T.K., Parry Smith D.J., "Introduction to Bioinformatics:", Pearson Education, Reprint, 2007.
2. Dr. Zhumur Ghosh, Dr. Bibekanand Mallick, "Bioinformatics. Principles and Application", Oxford University Press, India, Reprint, 2008.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1		X													
CO 2		X											X		
CO 3						X	X								

E-21 - DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To acquire knowledge on the concepts of Image transformation, restoration and segmentation in digital image processing. To gain knowledge in the compression techniques used in image processing.

COURSE OUTCOMES

CO1 : *Ability to implement image analysis algorithms.*

CO2 : *Ability to evaluate the methodologies for image segmentation, restoration, and topology.*

CO3 : *Apply image transformation in spatial and frequency domain.*

IMAGE FUNDAMENTALS

Digital image Processing - Fundamental steps in Image processing -components of Digital Image processing systems. Elements of Visual perception - Sampling and Quantization - Basic relationships between pixels. (9)

IMAGE ENHANCEMENT IN THE SPATIAL DOMIAN

Gray level transformation - Histogram processing - enhancement using arithmetic/logic operations - smoothing spatial filters - sharpening spatial filters - use of first and second derivatives for enhancement. (9)

IMAGE ENHANCEMENT IN THE FREQUENCY DOMIAN

Fourier transforms and frequency domain: one dimensional Fourier transforms and its inverse - two dimensional DFT and its inverse -filtering in the frequency domain - correspondence between filtering in the spatial and frequency domain - fast Fourier transform. Smoothing frequency domain filters: Gaussian low pass filters. Sharpening frequency domain filters: Gaussian high pass filters. (9)

IMAGE RESTORATION AND COMPRESSION TECHNIQUES

Image Restoration: Noise models: spatial frequency properties of noise - Important noise probability Density Functions. Periodic Noise Reduction: Band pass filters. Image Compression: fundamentals - image compression models - elements of information theory - error free compression - lossy compression - image compression standards. Introduction to color image processing. (9)

IMAGE ANALYSIS

Image segmentation: Detection of Discontinuities - Edge linking and boundary detection - Thresholding - Region-based segmentation - use of motion in segmentation. Image representation and description: Representation schemes - Boundary descriptors, Regional descriptors. (9)

TOTAL : 45

TEXT BOOK

1. Rafael C.Gonzalez, Richard E.Woods, "Digital Image Processing", Prentice Hall of India, Third Edition, 2009.

REFERENCE BOOKS

1. Jahne Bernd, "Digital Image Processing", Springer-Verlag Berlin Heidelberg, Netherland, Sixth Revised & Extended Edition, 2005.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Pearson Education, New Delhi.
3. William. K.Pratt, "Digital Image Processing", John Wiley, New York, Fourth Edition, 2006.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X										X			
CO 2	X			X									X		
CO 3	X		X	X				X							

E-22 - DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

To learn about Discrete Fourier Transform, Fast Fourier Transform, basics of filters and their properties. To understand multi-rate signal processing and the effects of finite word length in FIR filters.

COURSE OUTCOMES

- CO 1** : Knowledge on Discrete Fourier Transform, Fast Fourier Transform and their implementation
- CO 2** : Knowledge about basics of filters, their characteristics, and implementation methods to design digital FIR and IIR filters
- CO 3** : Analyze the effects of finite word length in FIR filters
- CO 4** : Ability to identify, formulate and solve problems in above mentioned topics

DISCRETE FOURIER TRANSFORM

Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals - The Discrete Fourier Transform(DFT) - Properties of the DFT - Linear and Circular Convolution, Overlap add and Overlap save method - Radix-2 FFT Algorithms - Decimation-in-Time FFT algorithm, Decimation-in-Frequency FFT algorithm - Spectral Factorization - Periodogram - FFT for Spectral estimation. **(10)**

IIR FILTER

Design of Discrete time IIR filters from continuous time filters - Analog filters - Bilinear Transformation Method of IIR Filter Design - Design of Lowpass and Highpass IIR Digital Filters - Spectral Transformation of IIR Filters - IIR filter realization - Direct, Cascade and Parallel realizations. **(9)**

FIR FILTER

Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters using Windows, Design of Linear-Phase FIR Filters by the Frequency - Sampling Method, Realization of FIR Filters. **(8)**

EFFECTS OF FINITE REGISTER LENGTH

Number representation - Analysis of coefficient quantization effects - A/D conversion noise analysis - Analysis of arithmetic round-off errors - Dynamic range scaling - Reduction of product round-off errors using error feedback - Limit cycles in IIR digital filters - Round-off errors in FFT algorithms. **(8)**

MULTIRATE DIGITAL SIGNAL PROCESSING

Decimation - Interpolation - Sampling rate Conversion by a Rational factor - Filter design and implementation of Sampling rate Converters - Multistage implementation of sampling rate converters - Application to sub band coding - Quadrature Mirror filter banks. **(10)**

TOTAL : 45

TEXT BOOKS

1. Sanjit Kumar Mitra, "Digital Signal Processing - A computer based approach", Tata McGraw Hill, Fourth Edition, 2011.
2. John G Proakis and Dimitris G Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, Fourth Edition, 2007.

REFERENCE BOOKS

1. Ifeather E.C. & Jervis B.W., "Digital Signal Processing: A Practical Approach", Pearson Education, Second Edition, 2002.
2. A.V. Oppenheim, R. W. Shafer and J.R.Buck, Discrete-Time Signal Processing, Pearson Education, Second Edition, 2007.
3. Ludeman L C, "Fundamentals of Digital Signal Processing", John Wiley, Singapore, 2009.
4. Monson H Kayes, "Schaum's Outlines - Digital Signal Processing", McGraw Hill, 2011.
5. Vinay K Ingle & John Proakis, "Digital Signal Processing using Matlab", Brooks/Cole, Second Edition, 2012.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X			X								X		X	
CO 2	X			X								X		X	
CO 3	X			X								X		X	
CO 4	X			X								X		X	

E-23 - SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Acquire fundamental knowledge on software testing concepts, testing policies, goals and test case design strategies and obtain knowledge on software quality concepts, quality standards and process models.

COURSE OUTCOMES

CO1 : *Ability to design test cases for practical applications.*

CO2 : *Formulate testing policies and goals for organizational requirements.*

CO3 : *Ability to apply the software configuration Management process, walkthroughs and inspections in practice.*

CO4 : *Plan and execute SQA functions during the design and delivery of software products and gain exposure to quality standards and process models such as ISO 9000 and CMMI.*

TESTING AND DEFECTS

Introduction to Testing as an Engineering Activity, Testing Fundamentals, Defects, Hypothesis and Tests (4)

BASIC TEST DESIGN STRATEGIES

Strategies and Methods for Test Case Design I: Introduction - Smart tester - Test case design strategies - Black box approach - Random - Equivalence class partitioning - Boundary value analysis - Other black box test design approaches - COTS - Black box methods and TMM level 2 goals. (6)

ADVANCED TEST DESIGN STRATEGIES

Strategies and methods for test case design II - Using White Box Approach to Test Design: Test Adequacy Criteria - Coverage and Control Flow Graphs - Covering Code Logic, Paths, Additional White Box Approaches, White box testing methods and TMM. (7)

TESTING GOALS, POLICIES, PLANS & DOCUMENTATION

Introductory concepts - Testing/debugging goals and policies - Test planning - Reporting test results - Role of three critical groups. Testing Web Applications: Introduction - Functional Testing - User Interface Testing - Usability Testing - Database Testing. (8)

SOFTWARE QUALITY AND QUALITY ASSURANCE

Definitions - Quality challenge - Quality control Vs Quality Assurance - SQA Functions : Benefits - Objectives - Roles and Responsibilities. SQA plans - Organizational Initiatives. Product and process quality: Product Quality - Models for software product quality - ISO 9126 - Process Quality Concepts. (9)

WALKTHROUGHS, INSPECTIONS AND SCM

Introduction - Structured Walk throughs - Inspections - Software Configuration Management: Need for SCM - Nomenclature - SCM Activities: Identifications - Base lining - Configuration control - Status accounting and auditing. (6)

QUALITY STANDARDS AND PROCESS MODELS

ISO 9000 standards: Origins - Overview of ISO 9001 standard - CMM: Levels and KPA's - CMMI: Background - Types - Process Maturity Levels in CMMI. (5)

TOTAL : 45

TEXT BOOKS

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2009, Reprint.
2. Nina S Godbole." Software Quality Assurance-Principles and Practice", Narosa Publishing, 2009.

REFERENCE BOOKS

1. Yogesh Singh," Software Testing", Cambridge University Press, 2012.
2. Watts S. Humphrey," Managing the Software Process", Addison-Wesley, 1998.
3. Alan C Gillies," Software Quality- Theory and Management", Cengage learning, 2012.
4. Daniel Galin,"Software Quality Assurance-From theory to implementation", Pearson Education, 2011.
5. Sargar Naik Piyu Tripathy," Software Testing and Quality Assurance-Theory and practice", John Wiley & Sons, 2008.

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COs	POs														
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CO 1	X	X	X				X					X			
CO 2	X		X									X			
CO 3	X	X				X				X		X			
CO 4	X		X				X			X		X			

E-24 - SUPPLY CHAIN MANAGEMENT

L	T	P	C
3	0	0	3

ASSESSMENT : THEORY

COURSE OBJECTIVE

Understand the basic concepts of Supply chains, process views, drivers of supply chain and gain insight in to demand forecasting, sourcing, and transporting and supply chain networks design techniques in real life applications.

COURSE OUTCOMES

- CO 1** : *Understand supply chain strategies and designing of supply chain network.*
- CO 2** : *Ability to manage inventory, trade promotions and forecast error to plan the demand of product.*
- CO 3** : *Gain practical insight in to the supply chain management and role of IT in managing the supply, demand, sourcing and co-ordinating aspects.*

UNDERSTANDING SUPPLY CHAIN

Objective of a Supply chain - Design phases-process view - Supply Chain performance: strategies - achieving strategic fit - Supply Chain Drivers and Obstacles: drivers -Framework for structuring drivers. (9)

DESIGNING THE SUPPLY CHAIN NETWORK

Distribution Network -Role - Influencing factors - Design options, E-Business and the distribution network, Network Design: role-influencing factors -Framework - Models for facility location and capacity allocation - Role of IT in Network Design. (9)

PLANNING DEMAND AND SUPPLY IN A SUPPLY CHAIN

Demand Forecasting - Characteristics -Forecasting methods - Forecast error measures - Role of IT in forecasting - Sales and Operations planning: managing supply and demand. (6)

PLANNING AND MANAGING INVENTORIES IN SUPPLY CHAIN

Role of Cycle Inventory - Estimating Cycle Inventory Related cost in practice - Economics of scale to exploit fixed cost - Economics of scale to exploit quantity discounts - Short term discounting: Trade Promotions. Managing Uncertainty in a supply chain: Role of safety inventory in a supply chain - Determining appropriate level of safety inventory - Impact of supply uncertainty on safety inventory - Role of IT in Inventory management. (7)

SOURCING, TRANSPORTING AND COORDINATION IN SUPPLY CHAIN

Role of Sourcing - Third and fourth party logistics provider - Supplier scoring and selection - Procurement process - Sourcing planning and analysis - The role of IT in Sourcing- Transportation: Role - Transportation modes - Design options - Milk run for Milk. Bullwhip effect - Obstacles to coordination. (8)

TECHNOLOGY IN SUPPLY CHAIN

Role of Information Technology - Supply chain IT framework - Management of customer relationship - Supplier relationship - Transaction management foundation Future of IT in supply chain. **(6)**

TOTAL : 45

TEXT BOOK

1. Sunil Chopra & Peter Meindl, "Supply Chain Management Strategy, Planning and Operation", Prentice Hall, Fourth Edition, 2009.

REFERENCE BOOK

1. Sahay B.S., "Emerging Issues in Supply Chain Management", Macmillan India Ltd, First Edition, 2004.

Mapping of Course Outcomes (COs) and Programme Outcomes (POs)

COs	POs														
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO 1	X	X	X												
CO 2		X	X							X		X			
CO 3	X		X							X		X			

COIMBATORE INSTITUTE OF TECHNOLOGY

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GOLDEN JUBILEE

(1956 - 2006)



**Department of Computer Science and Engineering &
Information Technology**

B.E. COMPUTER SCIENCE AND ENGINEERING

Curriculum and Syllabi

THIRD TO EIGHTH SEMESTER

(For the students admitted during 2013-2014 onwards)

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