REGULATIONS-2015

M.TECH-COMPUTER SCIENCE AND ENGINEERING

CURRICULUM -SYLLABUS 2015

SEMESTER-I

Theory						
SL.NO.	**SUB.CODE**	**SUBJECT NAME**	**L**	**T**	**P**	**C**
1	MMA 101	Advanced Mathematics for Computing	3	1	0	4
2	MCS 101	Data Structures and Algorithms	3	0	0	3
3	MCS 102	Advanced Computer Architecture	3	0	0	3
4	MCS 103	Object oriented Software Engineering	3	1	0	4
5	MCS 104	Network Security	3	0	0	3
Practical						
6	MCS 1L1	Software Development Lab	0	0	4	2

Total Credits: 19

SEMESTER-II

Theory						
SL.NO.	**SUB.CODE**	**SUBJECT NAME**	**L**	**T**	**P**	**C**
1	MCS 201	Data Warehousing and Data Mining	3	0	0	3
2	MCS 202	Software Reliability and Software Testing	3	0	0	3
3	MCS 203	Cloud Computing	3	0	0	3
4	MCS 204	Elective –I	3	0	0	3
5	MCS 205	Elective - II	3	0	0	3
Practical						
6	MCS 2L1	Date warehousing and Data Mining Lab	0	0	4	2

Total Credits: 17

SEMESTER-III

Theory						
SL.NO	**SUB.CODE**	**SUBJECT NAME**	**L**	**T**	**P**	**C**
1	MCS 301	Mobile and Pervasive Computing	3	0	0	3
2	MCS 302	Big data Analytics	3	0	0	3
3	MCS 3E1	Elective – III	3	0	0	3
4	MCS 3E2	Elective- IV	3	0	0	3
Project						
5	MCS 3P1	Project Phase – I	0	0	9	6

Total Credits: 18

SEMESTER-IV

SL.NO	**SUB.CODE**	**SUBJECT NAME**	**L**	**T**	**P**	**C**
Project						
1	MCS 4P2	Project Phase – II	0	0	24	12

Total Credits: 12

TOTAL NO. OF CREDITS FOR THE PROGRAMME : 66

LIST OF ELECTIVES

SUB.CODE	SUBJECT NAME	L	T	P	C
MCS 111	Object Oriented System Design	3	0	0	3
MCS 19	Software Engineering and Project Management	3	0	0	3
MCS 113	Object Oriented Analysis and Design	3	0	0	3
MCS 114	Software Reliability	3	0	0	3
MCS 115	Software Quality Management	3	0	0	3
MCS 116	Advance Database Technology	3	0	0	3
MCS 117	Parallel and Distributed Databases	3	0	0	3
MCS 118	Advanced Database Administration and Tuning	3	0	0	3
MCS 119	Object Oriented Database Design	3	0	0	3
MCS 90	Cryptography and Computer Security	3	0	0	3
MCS 91	Ad Hoc and Wireless Sensor Networks	3	0	0	3
MCS 92	Wireless Sensor Networks and Programming	3	0	0	3
MCS 93	TCP/IP Technology	3	0	0	3
MCS 94	Network Security and Management	3	0	0	3
MCS 95	TCP/IP Principles and Architecture	3	0	0	3
MCS 96	Wireless Networking and Mobile Computing	3	0	0	3
MCS 97	Information Retrieval Techniques	3	0	0	3
MCS 98	Text Data Mining	3	0	0	3
MCS 99	Web Data Mining	3	0	0	3
MCS 130	Social Network Analysis	3	0	0	3
MCS 131	Digital Signal Processing	3	0	0	3
MCS 132	Image Processing	3	0	0	3
MCS 133	Pattern Recognition Techniques	3	0	0	3
MCS 134	Multimedia Systems	3	0	0	3
MCS 135	Security Principles and Practices	3	0	0	3
MCS 136	Advanced Web Design	3	0	0	3

MCS 137	E-Commerce	3	0	0	3
MCS 138	Speech Recognition	3	0	0	3
MCS 139	Multicore Architecture	3	0	0	3
MCS 140	Stochastic Processes & Queuing Theory	3	0	0	3
MCS 141	Real Time Systems Design	3	0	0	3
MCS 142	Graph Theory and Optimization Techniques	3	0	0	3
MCS 143	Fuzzy And Genetic Algorithm	3	0	0	3
MCS 144	Middleware Technologies	3	0	0	3
MCS 145	Human Computer Interaction	3	0	0	3
MCS 146	Component Based System Design	3	0	0	3
MCS 147	Distributed Operating System	3	0	0	3
MCS 148	Embedded System	3	0	0	3
MCS 149	Speech Technology	3	0	0	3
MCS 150	Information Technology And Cyber Laws	3	0	0	3
MCS 151	PHP Programming	3	0	0	3
MCS 152	Quantum Theory & Algorithm Design	3	0	0	3
MCS 153	Information Security	3	0	0	3
MCS 154	Internet Technology	3	0	0	3
MCS155	Bio-Inspired Artificial Intelligence	3	0	0	3

MMA101 ADVANCED MATHEMATICS FOR COMPUTING

L	T	P	C
3	1	0	4

Course Objectives:

- To understand the basics of random variables and standard distributions
- To understand the arrival process and various queuing and server models
- To appreciate the use of simulation techniques
- To apply testing of hypothesis to infer outcome of experiments
- To apply mathematical linear programming techniques to solve constrained problems.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Identify the type of random variable and distribution for a given operational conditions

CO2: Study and design appropriate queuing model for a given problem or system situation

CO3: To understand and simulate appropriate application and distribution problems

CO4: Differentiate and infer the merit of sampling tests.

CO5: Formulate and find optimal solution in the real life optimizing, allocation and assignment problems involving conditions and resource constraints.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S		S			M					
CO2	S	S		S								
CO3	S	S		S								
CO4	S	S		S						M		
CO5	S	S		S				M				

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

RANDOM VARIABLES **12**

Random Variables – Bernoulli, Binomial, Geometric, Poisson, Uniform, Exponential, Erlang and Normal Distributions – Function of a Random Variable - Moments, Moment Generating Function.

UNIT II

QUEUING MODELS **12**

Poisson Process – Markovian Queues – Single and Multi-Server Models – Little's Formula – Machine Interference Model – Steady State Analysis – Self Service Queue.

UNIT III

SIMULATION **12**

Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to Queuing Systems.

UNIT IV

TESTING OF HYPOTHESIS **12**

Sampling Distributions – Estimation of Parameters - Statistical Hypothesis – Tests Based on Normal, t,Chi-Square andfDistributionsfor Mean, Variance and Proportion.

UNIT V

LINEAR PROGRAMMING **12**

Formulation – Graphical solution – Simplex method – Two phase method -Transportation and Assignment Problems. **TOTAL PERIODS: 60**

TEXT BOOKS:

1. Hamdy A. Taha, "Operations Research: An Introduction", Prentice Hall of India Pvt., Ltd. New Delhi, Eighth Edition, 2007.
2. Johnson, R.A. Miller and Freund's," Probability and Statistical for Engineers, Prentice Hall of India Pvt., Ltd., New Delhi, Seventh Edition, 2005.

REFERENCES:

1. Jay L. Devore," Probability and Statistics for Engineering and the Sciences", Cengage Learning,Seventh Edition, 2009.
2. Winston, W.L., "Operations Research", Thomson – Brooks/Cole, Fourth Edition,2003.
3. J.Medhi," Stochastic models of Queuing Theory", Academic Press, Elsevier, Amsterdam, 2003.
4. Ross. S.M., "Probability Models for Computer Science", Academic Press, 2002.

MCS101 DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

Course Objectives:

- Demonstrate familiarity with major algorithms and data structures.
- Analyze performance of algorithms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Determine which algorithm or data structure to use in different scenarios.
- Be familiar with writing recursive methods.
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
- Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.

Course Outcomes:
After successful completion of this course, the students should be able to

CO1: Explain the basic data structures and its operations.
CO2: Explain the concept of time complexity and space complexity.
CO3: Identify an appropriate data structure for a problem.
CO4: Make use of basic data structures to solve problems.
CO5: Summarize various searching and sorting algorithms.

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S								
CO2	S	S	S	S				M				M
CO3	S	S	S	S								
CO4	S	S	S	S		M						
CO5	S	S	S	S								

Course Assessment methods:

Direct	Indirect

1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

Overview of data structures, Review of Arrays, sparse matrices, Stacks, Queues, linked lists , doubly linked lists, Applications, dynamic storage management, Algorithm analysis, Efficiency of algorithms, Asymptotic Notations, Time complexity of an algorithm.

UNIT II **9**

Trees: Basic terminology, Binary Trees and its representations, Binary Search Trees, Binary Search Tree traversals, Red-Black Trees, AVL Trees and B Trees, applications of trees, Graphs: Terminology, representations, traversals, spanning trees, shortest paths, Basic Graph Algorithms, Depth first search and Breadth first Search and its analysis, single source shortest path problem, Dijkstra‘s algorithm.

UNIT III **9**

Divide and Conquer Paradigm: Divide and conquer recurrence equations and their solutions, Review of various sorting techniques using divide and conquer approach, Strassen‘s matrix multiplication.

UNIT IV **9**

Greedy Paradigm: Basic greedy strategy, Algorithms of Kruskal‘s and Prim‘s, greedy strategy in algorithms for the knapsack problem and Huffman trees.

Dynamic Programming paradigm, all pairs shortest path problem, longest common subsequence problems, 0 / 1 Knapsack problem, travelling sales person‘s problem.

UNIT V **9**

Back Tracking: general method, 4 Queen‘s Problem, Branch and Bound: general method, LC Search, Control Abstraction, Bounding, 0 / 1 Knapsack Problem.

TOTAL PERIODS: 45

TEXT BOOKS:

1. K.RahavaRao,”Introduction to Design Analysis of Algorithm”,Smash Words, 2013.
2. AdamDrozdek,”Data structures and Algorithms in c++”,4th edition,2009.

REFERENCES:

1. Ellis Horowitz, SartajSahni,Dinesh Mehta, “Fundamentals of Data Structures in C++”Galgotia book source, 2009.
2. Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest, “Introduction to Algorithms”, MIT press and McGraw Hill, 2001.

MCS102 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

Course Objectives:

- To have a thorough understanding of the basic structure and operation of a digital computer. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To study the hierarchical memory system including cache memories and virtual memory.

Course Outcomes:

CO1: Explain the need to switch from Uniprocessor to Multiprocessor
CO2: Explain the basics of pipelining and the influence of hazards on its performance.
CO3: Summarize the performance of cache memories.
CO4: Explain the storage and i/orequirements for processors.
CO5: Explain about shared memory architecture

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S	M								
CO2	S	M	S									
CO3	S	M	M							M		
CO4	S				S							
CO5	S											

Course Assessment methods:

Direct	Indirect
1 Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

Overview of Parallel computing, Parallelism in Uniprocessor Systems, Parallel computer structures, Pipelinecomputers, Array computers, Multiprocessor system, Dataflow computers, Architectural Classification schemes,parallel processing applications.

UNIT II **9**

An overlapped parallelism, Principal of Linear Pipelining, Classification of linear pipeline Instruction and Arithmetic pipelines, Principles of designing pipelined processors, internal forwarding and register tagging, Hazard detection andresolution, Job sequencing and collision prevention, Characteristics of Vector processing, multiple vector taskdispatching.

UNIT III **9**

SIMD array processor, SIMD computer organization, Masking and Data routing, SIMD Interconnectionnetwork: Static, Dynamic networks, Cube interconnection network, Shuffle exchange and Omega Network,SIMD Matrix multiplication.

UNIT IV **9**

Tightly and loosely coupled multiprocessors, Introduction to Data flow computing and flow Graph, Introductionto 8 bit and 16 bit Intel Microprocessor architecture and register set.

UNITV **9**

Assembly language programming based on Pentiums; Instruction: Data transfer, Logic, Branch operations,Looping Counting, Indexing, Programming Technique, Counters and Time Delays, Stacks and subroutines,Conditional call and Return Instructions.

TOTAL PERIODS: 45

TEXT BOOKS

1. Patterson and Hennessy, “Quantitative approach to Computer architecture”, Mc Graw Hill,209.
2. R.S Goankar, “Microprocessor Architecture, programming and application with the 8085”, Prentice Hall,2002.

REFERENCES:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, MGH, 2002.
2. D. A. Patterson and J. L. Hennessey, “Computer organization and design,” Morgan Kaufmann, 2002.

MCS103 OBJECT ORIENTED SOFTWARE ENGINEERING

L	T	P	C
3	1	0	4

Course Objectives:

- To investigate principles of object-oriented software engineering, from analysis through testing
- To learn techniques at each stage of development, including use cases, UML, Java and the JDK, and Junit
- To practice these principles and techniques by developing a "real world" software system prototype
- To study and experiment with alternative models of the software development process from the classical waterfall model to Extreme programming
- To discuss and explore recent innovations in OOSE, such as templates&STL, J2EE&JavaBeans, C#&.NET, Design patterns, Aspect-oriented programming, etc.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Demonstrate the conceptual, practical and technical skills of planning and monitoring a project plan using an appropriate CASE tool

CO2: Demonstrate an understanding of Agile Development

CO3: Describe in detail the theory, concepts and methods pertaining to the Unified Modelling Language (UML).

CO4: Create requirements using use case modelling concepts.

CO5: Demonstrate conceptual and technical skills in the analysis, design and implementation of a software system using Object Oriented Concepts.

CO6: Employ tools and techniques for Object Oriented Software Engineering.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S	S				S			S	
CO2		S	S					S			S	M
CO3	S		S	S				S			S	
CO4			S		S			S			S	
CO5		S	S					S			S	
CO6			S		S			S			S	

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **12**

Review of the traditional methodologies, Object oriented methodology, Advantage of Object oriented methodology

UNIT II **12**

Fundamental concepts of Object Orientation: Object, Class, Abstraction, Interface, Implementation, Aggregation, Composition, Generalization, Sub-Class and Polymorphism, Architecture Style, Object –oriented software engineering, application & component systems, use case components, object components, layered architecture.

UNIT III **12**

Sub- Systems, Services, Coupling, Cohesion and Layering, Static and dynamic aspects of collaborations Reuse processes, Object oriented business engineering, applying business engineering to define processes & organization, application family engineering, component system engineering, application system engineering.

UNIT IV **12**

Organizing a reuse business: Its transaction, Management, working Component based software development: component definition, component Meta model, component engineering vs application engineering

UNIT V **12**

Visual Modelling, Object Oriented Modelling, Component based and Model driven Development using UML:UML Basics, Component specification, context realization, component realization cases, Actors, and 4+1View.

TOTAL PERIODS: 60

TEXT BOOKS:

1. Jacobson, Griss Jacobson, Patrick Johnsson, “Software Reuse: Architecture, Process and Organization for business Success”, ACM press books, 2009.

REFERENCES*:*

1. Hans-Gerhard Gross, “Component based Software testing with UML”, Springer,2005.
2. CraigLarman, “Applying UML and Patterns”, Pearson Education, Second Edition, 2005.
3. GradyBooch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education, Third Edition, 2005.
4. Joffrey S. Poutin, “Measuring Software Reuse: Principles Practices, Economic Models”, Addison Wesley, 2001.

MCS104 NETWORK SECURITY

L	T	P	C
3	0	0	3

Course Objectives:

- Describe today's increasing network security threats and explain the need to implement a comprehensive security policy to mitigate the threats.
- Explain general methods to mitigate common security threats to network devices, hosts, and applications.
- Describe the functions of common security appliances and applications.
- Describe security recommended practices including initial steps to secure network devices.

Course Outcomes:

Students will be able to understand

CO1: Should be able to identify network security threats and determine efforts to counter them

CO2: Should be able to write code for relevant cryptographic algorithms.

CO3: Should be able to write a secure access client for access to a server

CO4: Should be able to send and receive secure mails

CO5: Should be able to determine firewall requirements, and configure a firewall.

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S								
CO2	S	S	S	S	S					M		
CO3	M	S	S	S	M							
CO4	S	S	S	S			M					
CO5	M	S	S	S	S							

Course Assessment Methods:

Direct	Indirect
1 Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I INTRODUCTION 9

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality.

UNIT II PUBLIC KEY CRYPTOGRAPHY 9

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

UNIT III AUTHENTICATION AND HASH FUNCTION 9

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard

UNIT IV NETWORK SECURITY 9

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.

UNIT V SYSTEM LEVEL SECURITY 9

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TOTAL PERIODS: 45

TEXTBOOK:

1 William Stallings, "Cryptography And Network Security Principles and Practices", Prentice Hall of India, Third Edition, 2003.

REFERENCES:

2. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003.
4. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.

MCS1L1 SOFTWARE DEVELOPMENT LAB

L	T	P	C
0	0	4	2

Course Objectives:

This laboratory course gives a complete understanding of the practical application in Software Engineering principles and methods.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Analyze the problem and do project planning.

CO2: Identify project scope, objectives, and perform data modeling.

CO3: Identify the deliverables in various phases of SDLC.

CO4: Implement solutions using modern tools.

CO5: Explain test plan, perform validation testing, coverage analysis.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S			M				S	S		
CO2	S	S	M		S							
CO3	S		S		S							
CO4	M	S			M						M	
CO5		M										

Course Assessment methods:

Direct	Indirect
1.Observation book 2.Record book 3.Model exam 4.End Semester exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

Prepare the following documents for each experiment and develop the software using software engineering methodology.

1. Problem Analysis and Project Planning
   Thorough study of the problem – Identify project scope, Objectives, infrastructure
2. Software Requirement Analysis
   Describe the individual Phases/ modules of the project, Identify deliverables
3. Data Modeling
   Use work products – data dictionary, use case diagrams and activity diagrams, build and test lass diagrams, sequence diagrams and add interface to class diagrams.
4. Software Developments and Debugging
5. Software Testing
   Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor.

1. Student Course Registration
2. Payroll Processing Application
3. Banking Process
4. Library Management System
5. Railway Reservation System
6. Trading System

TOTAL PERIODS: 30

MCS201 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Course Objectives:

- Learn about the Structure of Data Warehouse and its architecture
- Learn about the dramatic advances in data capture, processing power, data transmission, and storage capabilities which enable the organizations to integrate their various databases into data warehouses.
- Understand the concepts of various data mining Techniques

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Explain about the necessity of preprocessing and its procedure.

CO2: Apply the association rules for mining applications.

CO3: Identify an appropriate Classification techniques for various problems with high dimensional data.

CO4: Identify an appropriate Clustering techniques for various problems with high dimensional data

CO5: Outline various mining techniques on complex data objects.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S		S							
CO2	S	M	S		S							
CO3	S	M	S		M							
C04	M		S		M							
CO5	S	M	S		S							

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I: DATA WAREHOUSE **9**

Data warehouse roles and structures – What can a data warehouse do? – The cost of warehousing data. Data stores, Warehouses and Marts - The Data warehouse environment – Data warehouse characteristics - The Data Warehouse architecture - Metadata, Metadata Extraction - Implementing the Data Warehouse. Designing and building the Data Warehouse – The data warehouse project plan - Data warehouse architecture, specification and development - Data warehouse project success factors.

UNIT II: INTRODUCTION TO DATA MINING **9**

Basic Data Mining tasks, Data mining versus Knowledge discovery in data bases, Data Mining issues, Data Mining Metrics, Social implications of data mining, Data Mining from a database perspective. Data mining techniques - Introduction – A statistical perspective on Data mining – Similarity measures – Decision trees – Neural networks – Genetic algorithms.

UNIT III:CLASSIFICATION **9**

Introduction - Statistical based algorithms- Distance based algorithms – Decision tree based algorithms - Neural networks based algorithms – Rule based algorithms – Combining Techniques.

UNIT- IV: CLUSTERING **9**Introduction – Similarity and distance measures- Outliers – Hierarchical algorithms – Partitional algorithms – Clustering large data bases - Clustering with categorical attributes - Association Rules – Introduction – Large Item-sets – Basic Algorithms.

UNIT- V: WEB MINING, SPATIAL MINING, TEMPORAL MINING **9**

Web Mining – Introduction – Web Content Mining – Web Structure Mining – Web Usage Mining. Spatial Mining – Introduction – Spatial Data: Overview – Spatial Data Mining primitives - Generalization and Specialization – Spatial Rules – Spatial Classification algorithm – Spatial Clustering Algorithms. Temporal Mining – Introduction: Modeling temporal events.

TOTAL PERIODS: 45

TEXT BOOK:

1. Margaret H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education, 2003.

REFERENCE BOOKS:

1. George M. Marakas, "Modern Data Warehousing, Mining and Visualization: Core concepts", Pearson Education, 2003.
2. Aruj K Pujari, "Data Mining Techniques", Universities Press,2001.

MCS207 SOFTWARE RELIABILITY AND SOFTWARE TESTING

L	T	P	C
3	0	0	3

Course Objectives:

- The ability to tackle challenging computing problems using a comprehensive knowledge of computer science, while reflecting a commitment to quality, innovation, critical thinking, and continuous improvement.
- The ability of analyzing and solving complex technical problems from a broad perspective of computer science, including business, societal, and regulatory issues.
- The ability to function as both a leader and collaborative team member within different environments.
- The ability to Communicate effectively to all constituencies and uphold a commitment to professional and ethical conduct.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Outline software testing methods

CO2: Summarize risk in software project development.

CO3: Develop knowledge in understanding the importance of Software Reliability.

CO4: Utilize the appropriate testing techniques for information systems development.

CO5: Apply the metrics involved in software development.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S								S	
CO2	S		S							M	S	
CO3	S		S	S							S	
CO4	S		S							M	S	
CO5	S		S							M	S	

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

INTRODUCTION TO RELIABILITY ENGINEERING

Reliability - Repairable and Non Repairable systems - Maintainability and Availability - Designing for higher reliability - Redundancy - MTBF - MTTF MDT - MTTR- k out of in systems

UNIT II **9**

SOFTWARE RELIABILITY

Software reliability - Software reliability Vs Hardware reliability - Failures and Faults - Classification of Failures - Counting - System Configuration - Components and Operational Models - Concurrent Systems - Sequential Systems - Standby Redundant systems

UNIT III **9**

SOFTWARE RELIABILITY APPROACHES

Fault Avoidance - Passive Fault detection - Active Fault Detection - Fault Tolerance - Fault Recovery - Fault Treatment.

UNIT IV INTRODUCTION **9**

Software testing – Role of software testing – A structural approach to testing – Test strategy – methods for developing test strategy testing methodologies. Test plan – Requirements

testing – Walk through test tool – Risk matrix test tool – Testing for requirements phase and design phase – Design renew test tool – Test data and volume test tools.

UNIT V TESTING METHODS 9

Installation phase testing – Tools for acceptance test – Software acceptance process – Software maintenance – Methodologies for testing – Training and change installation. Tools and techniques – Cost estimate – For testing – Testing phase of life cycle – Point accumulation tracking system – Performance analysis of testing – Inspection plan and test plan documents.

TOTAL NO OF PERIODS: 45

TEXT BOOKS:

1. John D. Musa, "Software Reliability", McGraw Hill, 2004.
2. Patric D. T.O Connor, "Practical Reliability Engineering", 4th Edition, John Wesley & sons, 2003
3. William Perry, “Effective Methods for Software Testing”, 3/e, John Wiley & Sons/ Wiley India, 2006.

REFERENCE BOOKS:

1. DoronPeled, “Software Reliability Methods”,Springer,2011.
2. Alessandro Birolini, "Reliability Engineering", Springer ,2010
3. Ron Patton, “Software Testing”, Techmedia,2005
4. A.P.Mathur, “Foundations of Software Testing”, Pearson Education. 2008
5. Rajni, Renu; Oak, Pradeep, “Software Testing: Effective Methods, Tools and Techniques”, Tata McGraw Hill, 2004.

MCS203 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Course Objectives:

This module gives students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation, business development and agility in an organization.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Explain the cloud computing paradigm and its various forms of services
CO2: Identify the architecture, infrastructure and delivery models of cloud computing
CO3: Apply suitable virtualization concepts.
CO4: Illustrate different Programming Models and approaches.
CO5: Apply cloud Toolkits to solve the problems

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9

CO1	S		S		M							
CO2	S	M	S		S							
CO3	S		M		S							
CO4	S		S	M	S							
CO5	S		S		S							

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I UNDERSTANDING CLOUD COMPUTING 9

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT II DEVELOPING CLOUD SERVICES 9

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

UNIT III CLOUD COMPUTING FOR EVERYONE 9

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists –Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT IV USING CLOUD SERVICES 9

Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files

UNIT V OTHER WAYS TO COLLABORATE ONLINE 9

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Kumar Saurabh, "Cloud Computing Insights into New Era Infrastructure", Wiley Indian Edition,2011.
2. Michael Miller," Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.

REFERENCE BOOKS:

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On demand Computing, Applications and Data Centres in the Cloud with SLAs", Emereo Pty Limited, 2008.

MCS2L1 DATA WAREHOUSING AND DATA MINING LAB

L	T	P	C
0	0	4	2

Course Objectives:

The objective of the lab exercises is to use data mining techniques and to use standard databases available tounderstand DM processes (using any DM tool).

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Demonstrate the importance of preprocessing the given datasets.

CO2: Design and implement classification algorithm to classify given problems using modern tools.

CO3: Design and implement clustering algorithm to group the given attributes in a datasetusing modern tools.

CO4: Demonstrate to find association rules for the given datasetsusing modern tools.

CO5: Develop skills to design data warehouse for an enterprise.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1		S	S		S							
CO2		S	S		S							
CO3		S	S		S							
C04		S	S		S							
CO5		S	S		S							

Course Assessment methods:

Direct	Indirect
1.Observation book 2.Record book 3.Model exam 4.End Semester exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

List of Experiments:

1. Listing applications for mining
2. File format for data mining
3. conversion of various data files
4. Training the given dataset for an application
5. Testing the given dataset for an application
6. Generating accurate models
7. Data pre-processing – data filters
8. Feature selection
9. web mining
10. Text mining
11. Design of fact & dimension tables
12. Generating graphs for star schema.

TOTAL PERIODS: 30

L	T	P	C
3	0	0	3

MCS301 MOBILE AND PERVASIVE COMPUTING

Course Objectives:

- To understand the basics of Mobile computing and Personal computing.
- To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
- To study about the underlying wireless networks.
- To understand the architectures of mobile and pervasive applications.
- To become familiar with the pervasive devices and mobile computing platforms

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To deploy 3G networks.

CO2: To develop suitable algorithms for 4G networks.

CO3: To use sensor and mesh networks to develop mobile computing environment.

CO4: To develop mobile computing applications based on the paradigm of context aware Computing.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S									
CO2	S		S									
CO3	S		S				M					
CO4	S		S				M					

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

INTRODUCTION 9

Differences between Mobile Communication and Mobile Computing – Contexts and Names –Functions – Applications and Services – New Applications – Making Legacy Applications MobileEnabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies– Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories ofPervasive Devices

UNIT II

3G AND 4G CELLULAR NETWORKS 9

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – RadioNetwork Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PSDomains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and CellularNetworks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMaxIEEE 802.16d/e – WiMax Internetworking with 3GPP

UNIT III

SENSOR AND MESH NETWORKS 9

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination –Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks– Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspectsof Various Layers in WMN – Applications of Sensor and Mesh networks

UNIT IV

CONTEXT AWARE COMPUTING **9**

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location AwareComputing – Location Representation – Localization Techniques – Triangulation and Scene Analysis– Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware –Adaptation and Agents – Service Discovery Middleware

UNIT V APPLICATION DEVELOPMENT **9**

Three tier architecture - Model View Controller Architecture - Memory Management – InformationAccess Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME –Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", Second Edition, Tata McGraw Hill, 2010.
2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
3. Pei Zheng and Lionel M Li, "Smart Phone & Next Generation Mobile Computing", MorganKaufmann Publishers, 2006.

REFERENCE BOOKS:

1. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
2. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley,2009.
3. Frank Adelstein, ''Fundamentals of Mobile and Pervasive Computing", TMH, 2005.
4. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufmann Publishers,2004.
5. JochenBurthardt et al, "Pervasive Computing: Technology and Architecture of Mobile InternetApplications", Pearson Education, 2003.
6. Uwe Hansmaan et al, "Principles of Mobile Computing", Springer, 2003.

MCS302 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Course Objectives:

- To understand big data analytics as the next wave for businesses looking for competitive
- advantage
- To understand the financial value of big data analytics
- To explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component
- To understand how to mine the data
- To learn about stream computing
- To know about the research that requires the integration of large amounts of data

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Identify the need for big data analytics for a domain

CO2: Use Hadoop, Map Reduce Framework

CO3: Apply big data analytics for a give problem

CO4: Suggest areas to apply big data to increase business outcome

CO5: Contextually integrate and correlate large amounts of information automatically to gain faster insights.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1			S									S
CO2			S		M							S
CO3			S		M							S
CO4			S								M	S
CO5			S									S

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

INTRODUCTION TO BIG DATA **9**

Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Teamchallenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data -Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big dataAnalytics - Big data characteristics - Volume, Veracity, Velocity, Variety – Data Appliance andIntegration tools – Greenplum – Informatica.

UNIT II

DATA ANALYSIS **9**

Evolution of analytic scalability – Convergence – parallel processing systems – Cloud computing –grid computing – map reduce – enterprise analytic sand box – analytic data sets – Analytic methods –analytic tools – Cognos – Microstrategy - Pentaho. Analysis approaches – Statistical significance –business approaches – Analytic innovation – Traditional approaches – Iterative.

UNIT III

STREAM COMPUTING **9**

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimatingmoments – Counting oneness in a window – Decaying window - Realtime Analytics Platform(RTAP)applications IBM Infosphere – Big data at rest – Infosphere streams – Data stage – Statistical analysis– Intelligent scheduler – Infosphere Streams.

UNIT IV

PREDICTIVE ANALYTICS AND VISUALIZATION **9**

Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen models –Normal – Deviations from normal patterns – Normal behaviours – Expert options – Variable entry -Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Mainmemory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques –Hierarchical – K- Means – Clustering high dimensional data Visualizations - Visual data analysistechniques, interaction techniques; Systems and applications.

UNIT V

FRAMEWORKS AND APPLICATIONS **9**

IBM for Big Data – Map Reduce Framework - Hadoop – Hive - – Sharding – NoSQL Databases - S3 -Hadoop Distributed file systems – Hbase – Impala – Analyzing big data with twitter – Big data for Ecommerce– Big data for blogs.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS BusinessSeries, 209.
2. Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”,Elsevier, 2007
3. Michael Berthold, David J. Hand,” Intelligent Data Analysis”, Springer, 2007.

REFERENCES:

1. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge UniversityPress, 209.
2. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams withAdvanced Analytics”, Wiley and SAS Business Series, 209.
3. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, “Understanding Big Data: Analytics for EnterpriseClass Hadoop and Streaming Data”, McGraw Hill, 2011.
4. Pete Warden, Big Data Glossary, O’Reilly, 2011.
5. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier,Reprinted 2008.
6. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007.

MCS 111 OBJECT ORIENTED SYSTEM DESIGN

L	T	P	C
3	0	0	3

Course Objectives:

- The objective of this course is to expose the students to the Fundamentals and benefits of software reuse and some reuse problems.
- To provide a clear understanding of the advance concepts in developing different types of reusable component and processes for reuse

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To prepare object oriented design for small and medium scale problem.

CO2: To evaluate the appropriate life cycle model for the system under consideration.

CO3: To apply the various tools and patterns while developing software

CO4: Testing the software against usability, deployment, maintenance.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1		S	S		S	M					S	S
CO2		S	S		S	M					M	S
CO3		M	M		S	S					S	M
CO4		M	S		M	S					M	S

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

Review of the traditional methodologies, Object oriented methodology, Advantage of Object orientedmethodology.

UNIT- II **9**

Fundamental concepts of Object Orientation: Object, Class, Abstraction, Interface, Implementation,Aggregation, Composition, Generalization, Sub-Class and Polymorphism, Architecture Style, Object –orientedsoftware engineering, application & component systems, use case components, object components, layeredarchitecture.

UNIT- III **9**

Sub- Systems, Services, Coupling, Cohesion and Layering, Static and dynamic aspects of collaborationsReuse processes, Object oriented business engineering, applying business engineering to define processes &organization, application family engineering, component system engineering, application system engineering

UNIT - IV **9**

Organizing a reuse business: Its transaction, Management, working Component based software development:component definition, component meta model, component engineering vs application engineering.

UNIT -V **9**

Visual Modelling, Object Oriented Modelling, Component based and Model driven development using UML:,UML Basics, Component specification, context realizationMapping Design (Models) to Code – Testing - Usability – Deployment – Configuration Management – Maintenance.

TOTAL PERIODS: 45

REFERENCE:

1. Alistair Cockburn, "Agile Software Development" 2nd edition, Pearson Education, 2007.
2. Bernd Bruegge, Alan H Dutoit, "Object-Oriented Software Engineering", 2nd edition, Pearson Education,2003.

MCA19 SOFTWARE ENGINEERING AND PROJECT MANAGEMANT

L	T	P	C
3	0	0	3

Course Objectives:

- To provide students with a clear understanding of the unique risks, issues, and critical success factors associated with technology projects.
- To introduce students to the role and function of project management.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: It Enables the students understand what is a product, project and process is.

CO2: It enables students understand the lifecycle for a software project.

CO3: It enables students understand how the quality of a software product is calculated.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S	M		S	M	S			M	
CO2	S		S			S	M	S			M	
CO3	S		S			S		S				

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT-I **9**

Exposure to Software Project Management: Software development as a project, Stakeholders in softwareproject, Software product, process, resources, quality, and cost, Objectives, issues, and problems relating tosoftware projects.

UNIT-II **9**

Overview of Project Planning: Steps in project planning; Defining scope and objectives; work breakdownstructure; Deliverables and other products

UNIT-III **9**

Software Effort Estimation: Problem in software estimation; Effort estimation techniques COCOMO model.

Risk Analysis and Management: Nature and categories of risk in software development; risk Identification; Riskassessment; Risk mitigation, monitoring, and management;

UNIT-IV **9**

Selection of Appropriate Project Approach: Rapid application development; Waterfall model; V-process model;Spiral model; Prototyping, Incremental delivery.

UNIT -V **9**

Software Quality Assurance : Planning for quality; Product versus process quality management; Procedural andquantitative approaches; Defect analysis and prevention; Statistical process control; Pareto analysis; Causalanalysis; Quality standards; ISO 9000; Capability Maturity Model; Quality audit.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Bob Hughes and Mike Cotterell," Software Project Management", Tata McGraw-Hill Edition,2010
2. Joel Henry,"Software Project Management" , Pearson Education,2009.
3. Pankaj Jalote,"Software Project Management in practice" , Pearson Education.2005

REFERENCE:

1. S. A. Kelkar,"Software Project Management", ,PHI,209.

MCS 113 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

Course Objectives:

- To enable the students to design UML diagrams and to develop applications.
- To help the students to visualize the structure of the system and to reduce the system development time thereby increasing the productivity according to the industrial standards

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain fundamental concepts of object-oriented analysis and design approach.

CO2: Explain models for object-oriented system development.

CO3: Identify system development design patterns

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S	S	M			S			S	M
CO2		M	S	S	M			S			S	
CO3	S	M	S	M	M			S			S	

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I **9**

INTRODUCTION

Object Basics - Classes and Objects - Inheritance - Object relationship - Dynamic binding - OOSD Life Cycle - Analysis - Design - Implementation - Testing.

UNIT -II **9**

METHODOLOGY AND UML

Overview of methodologies - OMT, Booch methodology, Jacobson methodology; Patterns - Frameworks - Unified Approach - UML - Static and Dynamic Modeling, UML diagrams.

UNIT -III **9**

ANALYSIS

Use case model; Approaches for identifying classes - Noun Phrase approach - Responsibilities - collaborators - Identifying Object relationships - case study.

UNIT -IV **9**

DESIGN

Design Process - Design Axioms, Class Design, Object Storage and Object Interoperability; Access Layer - OODBMS, View Layer; case study.

UNIT -V **9**

SOFTWARE QUALITY

Testing Strategies - Test cases - Test plan - Continuous testing - debugging principles - case study.

TOTAL HOURS:45

TEXT BOOKS:

1 . Booch G., "Object Oriented Analysis and Design", Addison Wesley Publishing Company, 3rd Edition, 2009.

2. AliBahrami, "Object Oriented System Development", McGraw Hill International Edition,2008.

3. MikeO'docherty, ., "Object Oriented Analysis and Design", Addison Wesley Publishing Company, 2nd Edition, 2005.

REFERENCES:

1. Michael Blaha,"Object Oriented Modeling and Design", Pearson, 209.

2. B.S.Ainapure, ,"Object Oriented Modeling and Design",Pearson,2005.

MCS114 SOFTWARE RELIABILITY

L	T	P	C
3	0	0	3

Course Objectives:

To provide knowledge in

- Design principles for creating safe and reliable systems
- Reliability modeling
- Current trends in software reliability

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand common principles of software and system reliability engineering and also system safety.

CO2: Learn about software reliability measures.

CO3: Study software test methodology.

CO4: Learn about modeling software reliability growth.

CO5: Analyze the reliability of multi-component systems.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S			S						M
CO2	S		S		S	S					S	S
CO3	S	S	S	M		S						
CO4	S		S		S	S						S
CO5	S	M	S		S	S				M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

INTRODUCTION TO RELIABILITY ENGINEERING

Reliability - Repairable and Non Repairable systems - Maintainability and Availability - Designing for higher reliability - Redundancy - MTBF - MTTF MDT - MTTR- k out of in systems

UNIT -II **9**

SOFTWARE RELIABILITY

Software reliability - Software reliability Vs Hardware reliability - Failures and Faults - Classification of Failures - Counting - System Configuration - Components and Operational Models - Concurrent Systems - Sequential Systems - Standby Redundant systems

UNIT -III **9**

SOFTWARE RELIABILITY APPROACHES

Fault Avoidance - Passive Fault detection - Active Fault Detection - Fault Tolerance - Fault Recovery - Fault Treatment

UNIT- IV **9**

SOFTWARE RELIABILITY MODELING

Introduction to Software Reliability Modeling - Parameter Determination and Estimation - Model Selection - Markovian Models - Finite and Infinite failure category Models - Comparison of Models - Calendar Time Modeling

UNIT -V **9**

SPECIAL TOPICS IN SOFTWARE RELIABILITY

Management Techniques for reliability - Organization and Staffing - Programming Languages and Reliability - Computer Architecture and Reliability - Proving Program correctness & Reliability Design - Reliability Testing - Reliability Economics

TOTAL PERIODS: 45

TEXT BOOKS

1. John D. Musa, "Software Reliability", McGraw Hill, 2004.
2. Patric D. T.O Connor, "Practical Reliability Engineering", 4th Edition, John Wesley & sons, 2003.

REFERENCES

1. DoronPeled, “Software Reliability Methods”,Springer,2011.
2. Alessandro Birolini, "Reliability Engineering", Springer ,2010.

L	T	P	C
3	0	0	3

MCS115 SOFTWARE QUALITY MANAGEMENT

Course Objectives:

- To understand how to choose appropriate quality goals and to select, to plan, and to execute quality assurance activities throughout development and evolution to predictably meet quality and schedule goals.
- To study the software quality engineering metrics and models

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Employ software metrics and models in software development

CO2:select the best quality assurance plan during development

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S			S						M
CO2	S		S		S	S					S	S

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

INTRODUCTION

Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools - 7 QC Tools and Modern Tools; Other related topics - Business Process Re-engineering - Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

UNIT -II **9**

SOFTWARE ENGINEERING PRINCIPLES

Software Engineering Principles, Software Project Management, Software Process, Project and Product Metrics, Risk Management.

UNIT -III **9**

SOFTWARE QUALITY ASSURANCE MODELS

Software Quality Assurance; Statistical Quality Assurance - Software Reliability, Models for Quality Assurance - ISO-9000 - Series, CMM, SPICE, Malcolm Baldrige Award.

UNIT -IV **9**

SOFTWARE PROCESSES & TESTING

Software Process - Definition and implementation; internal Auditing and Assessments; Software testing - Concepts, Tools, Reviews, Inspections & Walkthroughs; P-CMM.

UNIT -V **9**

TQM

Total Quality Management - Introduction, Software reuse for TQM, Software testing method for TQM, Defect Prevention and Total Quality Management, Zero Defect Software Development, Clean room Engineering.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Allan Gillies, "Software quality Theory & Management ", Thomson internationalPress ,2011.
2. AmitavaMitra, ”Fundamentals of Quality Control and Improvement” ,Wiley, 2008.

REFERENCES:

1. Roger Pressman, "Software Engineering ", 6th edition, McGraw Hill, 2005.
2. Kim H. Pries, Jon M. Quigley, "Total Quality Management for Software", CRC Press, 2005.

MCS 116 ADVANCE DATABASE TECHNOLOGY

L	T	P	C
3	0	0	3

Course Objectives:

- The objective of this course is to expose the students to the implementation techniques of database system.
- This course explains techniques for query processing and optimization with transaction and concurrency control techniques

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: It enables the students to understand the concept of relational databases and relational operations.

CO2: It enables the students to understand the concept of Object Oriented Databases and its Operations.

CO3: It enables the students to understand the concept of Parallel and Distributed Databases.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S									S
CO2	S		S		M							S
CO3	S		S									S

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I

RELATIONAL DATABASES **9**

Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Multivaluedand Join Dependency, Normal Forms, Rules about functional dependencies.

UNIT -II

QUERY PROCESSING AND OPTIMIZATION **9**

Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and QueryOptimization, Limitations of Relational Data Model, Null Values and Partial Information.

UNIT -III

OBJECTED ORIENTED AND OBJECT RELATIONAL DATABASES **9**

Modelling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects,Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object RelationalDatabases.

UNIT - IV

PARALLEL AND DISTRIBUTED DATABASES 9

Distributed Data Storage – Fragmentation & Replication, Location and FragmentTransparency Distributed Query Processing and Optimization, Distributed Transaction Modelling andconcurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel QueryEvaluation.

UNIT -V

ADVANCED TRANSACTION PROCESSING 9

Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, WeakLevels of Consistency, Transaction Work Flows, Transaction Processing Monitors.Multimedia databases, Databases on the Web and Semi–Structured DataCase Study: Oracle 10g and 11i.

TOTAL PERIODS:45

TEXT BOOKS:

1. Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

2. Elmarsi, Navathe, Somayajuu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007

3. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007.

REFERENCES:

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007.

2. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.

3. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6thEdition, 2006.

MCS117 PARALLEL AND DISTRIBUTED DATABASES

L	T	P	C
3	0	0	3

Course Objectives:

- To realize the need of parallel processing, to cater the applications that require a system capableof sustaining trillions of operations per second on very large data sets
- To understand the need of data integration over data centralization

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Students Get good knowledge on the need, issues, design and application of both parallel and distributed databases.

CO2: Students know how to write optimal queries to cater applications of that need these forms of databases.

CO3: Students be able to fragment, replicate and localize their data as well as their queries to get their work done faster.

CO4: Students get idea on other similar trends of optimal data processing.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S									S
CO2	S		M		M							M
CO3	S		S									M
CO4	S		S									S

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

INTRODUCTION TO PARALLEL DATABASES

Need of Parallelism - Forms of parallelism – architecture – Analytical models. Basic Query Parallelism – Parallel Search- Parallel sort and Group By- Parallel Join

UNIT II **9**

ADVANCED QUERY PROCESSING IN PARALLEL DATABASES

Parallel indexing.Parallel Universal Qualification – Collection Join Queries. Parallel Query Scheduling– Optimization, Applications

UNIT III **9**

INTRODUCTION TO DISTRIBUTED DATABASES

Overview - Promises of DDB –Design Issues – DDB Design – DDB Integration – Data and AccessControl.

UNIT IV **9**

QUERY PROCESSING IN DISTRIBUTED DATABASES

Overview of Query Processing – Query Decomposition and Data Localization – Optimization ofQueries, Multi-database Query Processing.

UNIT V **9**

TRANSACTION MANAGEMENT AND OTHER ADVANCED SYSTEMS

Introduction – Concurrency Control - Distributed DBMS Reliability – Data Replication – DDBApplications, Distributed Object Database Management – Peer -to-Peer Data Management – WebData Management – Streaming Data and Cloud Computing.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Sandro Fiore, Giovanni Aloisio ,"Grid and Cloud Database management",ACM,2011.
2. David Taniar, Clement H.C.Leung, WennyRahayu, Sushant Goel , "High performance parallel Database processing and Grid databases" , John Wiley & Sons, 2008.

REFERENCES:

1. M. Tamer Ozsu and Patrick Valduriez, "Principles of Distributed Database Systems", Springer Science + Business Media , 3rd Edition, 2011.

MCS118 ADVANCED DATABASE ADMINISTRATION AND TUNING

L	T	P	C
3	0	0	3

Course Objectives:

- At the end of the course the students would be able to
- Design and implement relational database solutions for general applications.
- Develop database scripts for data manipulation and database administration.
- Understand and perform common database administration tasks, such as database

Monitoring, performance tuning, data transfer, and security.

.

Course Outcomes:

CO1: Students understands advanced features of databases in design, administration, and applications

CO2: Aspires to improve the performance of a database

CO3: Students learn about optimization of existing resources usage within the database environment.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S									S
CO2	S		S									S
CO3	S		S									S

Course Assessment methods:

Direct	Indirect
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I **9**

INTRODUCTION TO DATABASE ADMINISTRATION

Database Administration - DBA Tasks- Database Design -Performance Monitoring and Tuning –Availability - Database Security and Authorization - Backup and Recovery - Data Integrity- DBMSRelease Migration - Types of DBAs - Creating the Database Environment - Choosing a DBMS -DBMS Architectures - DBMS Clustering -DBMS Proliferation - Hardware Issues -Installing the DBMS -DBMS Installation Basics Hardware Requirements - Storage Requirements Memory RequirementsConfiguring the DBMS - Connecting the DBMS to Supporting Infrastructure Software –InstallationVerification - DBMS Environments - Upgrading DBMS Versions and Releases - Fallback PlanningMigration Verification.

UNIT II **9**

DATABASE SECURITY, BACKUP AND RECOVERY

Database Users - Granting and Revoking Authority - Types of Privileges - Granting to PUBLIC Revoking Privileges - Security Reporting - Authorization Roles and Groups - Using Views for Security- Using Stored Procedures for Security Auditing External Security - Job Scheduling and Security -Image Copy Backups - Full vs. Incremental Backups - Database Objects and Backups – DBMS. Control - Concurrent Access Issues Backup Consistency - Log Archiving and Backup – DBMSInstance Backup - Designing the DBMS Environment for Recovery - Alternate Approaches toDatabase Backup - Recovery - Determining Recovery Options Types of Recovery – DBA Tools –DBA Rules of Thumb.

UNIT III **9**

FUNDAMENTALS OF TUNING

Review of Relational Databases – Relational Algebra – Locking and Concurrency Control – Correctness Consideration – Lock Tuning – Logging and the Recovery Subsystem – Principles ofRecovery – Tuning the Recovery Subsystem – Operating Systems Considerations – HardwareTuning.

UNIT IV

INDEX TUNING AND QUERY OPTIMIZATION **9**

Types of Queries – Data Structures – B tree – B+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison ofIndexing and Hashing Techniques. Optimization Techniques - Tuning Relational Systems –-Normalization – Tuning Denormalization – Clustering Two Tables – Aggregate maintenance – RecordLayout – Query Cache – Parameter Cache - Query Tuning – Triggers – Client Server Mechanisms –Objects, Application Tools and Performance –Tuning the Application Interface – Bulk Loading Data –Accessing Multiple Databases.

UNIT V TROUBLESHOOTING **9**

Query Plan Explainers – Performance Monitors – Event Monitors – Finding “Suspicious” Queries –Analyzing a Query’s Access Plan – Profiling a Query Execution – DBMS Subsystems.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Dennis Shasha and Philippe Bonnet, "Database Tuning, Principles, Experiments and Troubleshooting Techniques", Elsevier Reprint 2005.
2. Craig S. Mullins, "Database Administration: The Complete Guide to Practices and Procedures", Addison-Wesley Professional, 2002.

REFERENCES:

1. Silberschatz, Korth, Database System Concepts, McGraw hill, 6th edition, 2010.
2. Thomas Connoly and CarlolynBegg, Database Systems, A Practical Approach to Design,implementation and Management, Fourth Edition, Pearson Education 2008.

MCS119 OBJECT ORIENTED DATABASE DESIGN

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce basic and fundamental concepts of DBMS & ER model.
- To introduce the concepts of extended ER model and object oriented programming database concepts

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Design and motivate software architecture for large scale software systems.
CO2: Recognize major software architectural styles, design patterns, and frameworks.
CO3: Describe a software architecture using various documentation approaches.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S		S							S
CO2	S	S	S		M							S
CO3	S	M	S		S							S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT-I **9**

Database management systems - The concepts of the database- levels of representation, using a DBMS, Relational systems - toward the relational model, The relational model, using a relational system, Advantages & limitations of relational systems, A new generation of systems - A new computing context, New Applications.

UNIT-II **9**

Fundamental Aspects - The role of the data model general principles, Data manipulation languages, some important models - ER, SDM, IFO, RM/T, Daplex, Type systems - Concept of type. Data abstraction. Polymorphism, sub typing Integrating models & type system- Abstract types and modeling, concepts of inheritance, classes & relations, views & desired data constants & transaction.

UNIT-III **9**

Extended relational models and system - different approaches, model with structured values, Deductive models and logic programming, models with object identity. Extensible systems, Database programming language - Two approaches Integration into an existing language, Persistent programming languages.

UNIT-IV **9**

Object oriented systems - Principles & technology databases, The 02 system - origins & objective Data model, Data manipulation, interface generator, the programming environment, Implementation of the 02 system.

UNIT-V **9**

Object manager architecture - Introduction, Problems encountered, Addressing mechanisms, Virtual memory, Two address levels, distributed architecture, Data management - Data representation, Large sets & long strings, Representing inheritance, Indexing, clustering, transactions & versions.

TOTAL PERIODS:45

TEXT BOOKS:

1. C.S.R. Prabhu,"Object-Oriented Database Systems: Approaches and Architectures", 2nd edition., Prentice-Hall Of India Pvt. Limited, 2005.
2. Jan L. Harrington,"Object-oriented Database Design Clearly Explained",,Morgan Kaughman,2000.

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth, S. Sudharson, "Database System Concepts", 6th Edition, Tata McGraw Hill, 2011.
2. RamezElmasri, ShamKant B.Navathe,"Fundamentals of Database Systems", 5th Edition, Pearson Education, 2008.
3. M. Tamer Ozsu and PatricValduriea, "Principles of Distributed Database systems", Pearson Education, 2000.

MCS90 CRYPTOGRAPHY AND COMPUTER SECURITY

L	T	P	C
3	0	0	3

Course Objectives:

- To learn the concepts of trust categories
- To understand trust architecture and formalization of security properties
- To learn trusted computing and administration

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain security issues and objectives in computer systems and networks.

CO2: Explain the workings of fundamental cryptographic, authentication, network security and system security algorithms.

CO3: Identify the appropriate cryptography scheme & security mechanism for different Computing environment and information systems.

CO4: Develop security protocols and methods to solve societal security problems.

CO5: Analyze security of network protocols and systems.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S								S
CO2	S	S	S	S	M							S
CO3	S	S	S	S	M							S
CO4	S	M	S	S								S
CO5	S	S	S	S								S

Course Assessment methods:

Direct	**Indirect**
1.Internal Tests 2. Assignments 3. Seminar 4.Quiz 5.Online Test 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

INTRODUCTION **9**

Introduction – Trust and Computing – Instantiations – Design and Applications –Progression – Motivating scenarios – Attacks. Design goals of the trustedplatform modules. Introduction to simulators – Implementation of attacks.

UNIT II **9**

ARCHITECTURE, VALIDATION AND APPLICATION CASE STUDIES

Foundations – Design challenges – Platform Architecture – Security architecture –erasing secrets – sources – software threats – code integrity and code loading.Outbound Authentication – Problem – Theory – Design and Implementation -Validation – Process – strategy – Formalizing security properties – Formalverification – other validation tasks – reflection. Application case studies – Basicbuilding blocks – Hardened web servers – Right's management for Big Brother'scomputer – Private Information – Other projects TCPA/TCG.

UNIT III –PROGRAMMING INTERFACES TO TCG **9**

Experimenting with TCPA/TCG – Desired properties- Lifetime mismatch –Architecture – Implementation – Applications.Writing a TPM device driver- Lowlevelsoftware – Trusted boot – TCG software stack – Using TPM keys.Implementation using simulator tools.

UNIT IVTSS CORE SERVICE AND SECURE STORAGE 9

TSS core service – Public key cryptography standard – Architecture – Trustedcomputing and secure storage – Linking to encryption algorithms – encryptingfiles and locking data to specific PCs-content protection – secure printing andfaxing.Simulation analysis of symmetric and public key cryptographic standards -performance evaluation of these trust models.

UNIT VTRUSTED COMPUTING AND SECURE IDENTIFICATION 9

Trusted Computing and secure identification – Administration of trusted devices –
Secure /backup maintenance – assignment of key certificates-secure timereporting-key recovery – TPM tools- Ancillary hardware.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Challener D., Yoder K., Catherman R., Safford D., Van Doorn L.. “A Practical Guide to Trusted Computing”. IBM press, 2008.
2. Sean W.Smith, “Trusted Computing Platforms: Design and Applications”.Springer Science and Business media, 2005.

REFERENCES

1. William Stallings, “Cryptography and Network Security – Principles and Practices”, Prentice Hall of India, Third Edition, 2003.
2. AtulKahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Third Edition, pearson Education, 2003.
4. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001.

MCS91 AD HOC AND WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

Course Objectives:

- To learn about the issues in the design of wireless ad hoc networks
- To understand the working of protocols in different layers of mobile ad hoc and sensornetworks
- To expose the students to different aspects in sensor networks
- To understand various security issues in ad hoc and sensor networks and solutions to theissues.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply knowledge of wireless sensor networks to various application areas.
CO2: Design, implement and maintain wireless sensor networks.
CO3: Formulate and solve problems creatively.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	M	S								S
CO2	S	S	S	S	M							S
CO3	S	S	S	S								S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I MAC& ROUTING IN AD HOC NETWORKS 9

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple- Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Ad hoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing Protocols.

UNIT- II TRANSPORT & QOS IN AD HOC NETWORKS 9

TCP's challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model

UNIT -III MAC & ROUTING IN WIRELESS SENSOR NETWORKS 9

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention-Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zig bee – Topology Control – Routing Protocols

UNIT -IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS 9

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control – In-network processing – Operating systems for wireless sensor networks – Examples.

UNIT -V SECURITY IN AD HOC AND SENSOR NETWORKS 9

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tampertechniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.

TOTAL PERIODS: 45

TEXT BOOKS:

1. ErdalÇayirci ,ChunmingRong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009.
2. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, “Ad Hoc Mobile Wireless Networks”, Auerbach Publications, 2008.
3. Holger Karl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Inc., 2005.
4. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”,Pearson Education, 2004.

REFERENCES:

1. Carlos De MoraisCordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition)”, World Scientific Publishing, 2011.
2. WaltenegusDargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010.
3. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.

MCS92 WIRELESS SENSOR NETWORKS AND PROGRAMMING

L	T	P	C
3	0	0	3

Course Objectives:

- Gain knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Gain knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.
- Knowledge of sensor networks and their characteristics. This includes design of MAC layer protocols, understanding of power management, query processing, and sensor databases.
- Hands-on experience in designing and implementing ad hoc network functionality using network simulation tools and Pocket PCs.

Course Outcomes:

CO1: Apply knowledge of wireless sensor networks to various application areas.
CO2: Design, implement and maintain wireless sensor networks.
CO3: Formulate and solve problems creatively.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S				S				S
CO2	S	M	S	S	M			S				S
CO3	S	S	S	S				S				S

Course Assessment methods:

Direct	Indirect

1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT – I **9**

INTRODUCTION TO WSN

Introduction and Overview of Wireless Sensor Networks Introduction, Brief Historical Survey of Sensor Networks, and Background of Sensor Network Technology, Ah-Hoc Networks, Applications of Wireless Sensor Networks: Sensor and Robots, Reconfigurable Sensor Networks, Highway Monitoring, Military Applications, Civil and Environmental Engineering Applications, Wildfire Instrumentation, Habitat Monitoring, Nanoscopic Sensor Applications, Another Taxonomy of WSN Technology, Basic Sensor Network Architectural Elements, Home Control, Medical Applications, Basic Wireless Sensor Technology : Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends, Wireless Network Standards: IEEE 802.15.4, ZigBee, IEEE 1451

UNIT – II

MEDIUM ACCESS CONTROL **9**

Medium Access Control Protocols for Wireless Sensor Networks Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs: Schedule-Based Protocols, Random Access-Based Protocols, Coordination, Schedule Synchronization, Adaptive Listening, Access Control and Data Exchange (BMAC,Box-MAC, Bit-MAC, H-MAC, I-MAC, O-MAC, S-MAC. Ri-MAC, T-MAC, QMAC (Querry MAC), Q-MAC (QoS MAC), X-MAC).

UNIT – III **9**

ROUTING IN WSN

Routing Protocols for Wireless Sensor Networks Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks Network Scale and Time-Varying Characteristics, Resource Constraints, Sensor Applications Data Models, Routing Strategies in Wireless Sensor Networks: WSN Routing Techniques, Flooding and Its Variants, Sensor Protocols for Information via Negotiation, Low-Energy Adaptive Clustering Hierarchy, Power-Efficient Gathering in Sensor Information Systems, Directed Diffusion, Geographical Routing.

UNIT -IV **9**

TCP AND UDP

Transport Control Protocols and Middle wares for Wireless Sensor Networks Traditional Transport Control Protocols: TCP (RFC 793), UDP (RFC 768), MobileIP, Introduction, WSN Middleware Principles, Middleware Architecture: Existing Middleware: MiLAN (Middleware Linking Applications and Networks), IrisNet (Internet-Scale Resource-Intensive Sensor Networks Services)

UNIT- V **9**

OPERATING SYSTEMS IN WSN

Operating Systems for Wireless Sensor Networks Introduction, Examples of Operating Systems: TinyOS,Mate, MagnetOS

TOTAL PERIODS: 45

TEXT BOOKS:

1. KazemSohraby, Daniel Minoli, TaiebZnati ,"Wireless Sensor Network," Wiley,2007.
2. Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong ,"Wireless Sensor Networks Signal Processing and Communications"John Wiley & Sons,2007.

REFERENCES:

1. Sridhar S. Iyengar, NandanParameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, " Fundamentals of Sensor Network Programming: Applications and Technology" Wiley,2011.
2. C. S. Raghavendra,"Wireless sensor networks" Springer,2007.
3. Murthy ,"Ad Hoc Wireless Networks: Architectures And Protocols ", Pearson Education,2004.

MCS93 TCP/IP TECHNOLOGY

L	T	P	C
3	0	0	3

Course Objectives:

- To learn the basics of socket programming using TCP Sockets.
- To learn about Socket Options97
- To learn to develop Macros for including Objects In MIB Structure
- To understand SNMPv1, v2 and v3 protocols & practical issues.

Course Outcomes:

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

CO1: Understand the internals of the TCP/IP protocols

CO2: Understand how TCP/IP is actually implemented

CO3: Understand the interaction among the protocols in a protocol stack

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S								S
CO2	S	S	S	S	M							S
CO3	S	M	S	S								S

Course Assessment methods:

Direct	Indirect
1. Internal Tests	1.Course & Survey
2. Assignments	2. Faculty Survey
3. Seminar	3.Industry
4.Online Test	4.Alumni

L	T	P	C
3	0	0	3

5.Quiz 6. End Semester Exam	

UNIT I

FUNDAMENTALS **9**

Internetworking concepts - IP and datagram forwarding - TCP services - Interactive data flow - Timeout and retransmission - Bulk data flow - Persist timer – Keep-alive timer.

UNIT II **9**

ARP AND IP Structure of TCP/IP in OS - Data structures for ARP - Cache design and management - IP software design and organization - Sending a datagram to IP

UNIT III **9**

IP ROUTING IMPLEMENTATION Routing table - Routing algorithms - Fragmentation and reassembly - Error processing (ICMP) - Multicast Processing (IGMP).

UNIT IV **9**

TCP I/O PROCESSING AND FSM

Data structure and input processing - Transmission control blocks - Segment format - Comparison - Finite state machine implementation - Output processing - Mutual exclusion - Computing TCP data length

UNIT V

TCP TIMER AND FLOW CONTROL **9**

Timers - Events and messages - Timer process - Deleting and inserting timer event - Flow control and adaptive retransmission - Congestion avoidance and control - Urgent data processing and push function

TOTAL PERIODS: 45

TEXT BOOKS

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, 4th edition, McGraw Hill, 2013.
2. Douglas E. Comer, “Internetworking with TCP/IP: principles, protocols and architecture” (Volume1), 6th Edition, PHI Learning, 2013.

REFERENCES:

1. Douglas E. Comer, David L. Stevens, “Internetworking with TCP/IP, design, implementation and internals Volume 2, 3rd Edition, PHI Learning, 2009.
2. Ed Tittel, Laura Chappell, “TCP/IP”, 1st Edition, Cengage Learning, 2008.
3. Dr. SidnieFeit, TCP/IP, architecture, protocols and implementation with IPv6 and IP Security, Tata McGraw-Hill, 2008.

MCS94 NETWORK SECURITY AND MANAGEMENT

Course Objectives:

- The objective of this course is to identify the different network security measures and to analyze each of them.
- To study protocols, issues related to implementation of network security

Course Outcomes:

The student will be able to

CO1: Put into practice the various symmetric and asymmetric key algorithms.

CO2: Understand the importance of network security.

CO3: Handle different kinds of attacks

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S	S				S			S	S
CO2	S		S	S			M	S			S	S
CO3	S	M	S	S			M	S			M	S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -1 **9**

CRYPTOGRAPHY

Classical Cryptography, Various types of Cipher, Cryptanalysis, Computer Security, Threats to security, Historyof Computer security, Computer System Security and Access Controls (System access and data access). Threats- Viruses, worms, Trojan horse, bombs, trap doors, spoofs, email virus, macro Viruses, remedies, Intruders,Malicious software, Firewalls, vulnerabilities & Threats, Network Denial of service attack.

UNIT- II **9**

SWITCHING AND ROUTING

Technologies - Switching Design, Switching Types - Layer 2 and 3 Switching, Spanning Tree Protocol, Redundancy in Layer 2 Switched Networks, STP Terminology and Operation, Virtual LANs – Trunks - Inter-VLAN Routing - Multilayer Switching, Switching Security and Switching Design Considerations IPv4 RoutingDesign.IPv4 Address Design - Private and Public Addresses – NAT - Subnet Masks - Hierarchical IP Address Design -IPv4 Routing Protocols – Classification - Metrics - Routing Protocol Comparison - IPv4 Routing Protocol. Selection.

UNIT III **9**

VULNERABILITIES

L	T	P	C
3	0	0	3

Network Security Design, Hacking – Vulnerabilities - Design Issues - Human Issues - Implementation Issues –Threats - Reconnaissance Attacks - Access Attacks - Information Disclosure Attacks - Denial of Service Attacks- Threat Defense - Secure Communication - Network Security Best Practices - SAFE Campus Design.

UNIT IV **9**

NETWORK SECURITY

Network Security-Kerberos, X.509, some network security projects - SDNS, DISNet,Project MAX, Secure NFS Security- E-Mail Security, IP security, Web security, Server security-security fornetwork server, web servers, mobile technologies (java and Java script etc)

UNIT V **`9**

CASE STUDY

Network Management Design: ISO Network Management Standard - Protocols and Tools – SNMP – MIB –RMON - Cisco NetFlow – Syslog – CiscoWorks - Network Management Strategy - SLCs and SLAs – IPService-Level Agreements – Content Networking Design – Case Study – Venti Systems.

TOTAL PERIODS:45

TEXT BOOKS:

1. 1.Introduction to computer Security- Mathew Bishop, Addison-Wisley,2006.
2. 2.DianeTiare and Catherine Paquet, ―Campus Network Design Fundamentals, Pearson education, 2006.
3. William Stallings, "Cryptography and Network Security – Principles and Practices", PHI,3rd Edition.
4. AtulKahate, "Cryptography and Network Security", TMH, 2003

REFERENCES:

1. William Stallings; Network Secuirty Essentials, Pearson publication, 2005.
2. William Stallings" Cryptography and Network Security, Pearson publication, 4thedition, 2004.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003.
4. Mathew Bishop ,"Computer Security: Art and Science" , Addison-Wisley,2003.
5. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001. 6. Craig Zacker, "The Complete Reference: Upgrading and Troubleshooting Networks", Tata McGraw-Hill, 2000.

MCS95 TCP/IP PRINCIPLES AND ARCHITECTURE

Course Objectives:

- To provide a solid foundation for understanding the communication process of the Internet

- Provide exposure to fundamental concepts of computer networking in the context of the TCP/IP model and protocols.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the principles of internetworking protocols.

CO2: Summarize the functions of transport protocols.

CO3: Explain the concepts of routing, subnetting and super netting.

CO4: Get an exposure to various next generation protocols in internetworking.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1		M	S	S								S
CO2		M	S	S		M						S
CO3			S	S								
CO4			S	S		M						

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

INTRODUCTION

Protocols and standards - OSI model - TCP/ IP protocol suite - addressing - versions - underlying technologies.

UNIT -II **9**

IP ADDRESSES, ROUTING, ARP AND RARP

Classful addressing - other issues - subnetting - supernetting - classless addressing - routing methods - delivery - table and modules - CIDR - ARP package - RARP.

UNIT -III **9**

IP, ICMP, TGMP AND UDP

Datagram - fragmentation - options - checksum - IP package - ICMP - messages, formats - error reporting - query - checksum - ICMP package - IGMP - messages, operation - encapsulation - IGMP package - UDP - datagram - checksum - operation - uses - UDP package.

UNIT- IV **9**

TCP, UNICAST AND MULTICAST ROUTING PROTOCOLS

Services - flow, congestion and error control - TCP package and operation - state transition diagram - Unicast routing protocols - RIP - OSPF - BGP - multicast routing - trees protocols MOSPF - CBT - PIM.

UNIT –V **9**

APPLICATION LAYER, SOCKETS

Client server model - concurrency - processes - sockets - byte ordering - socket system calls - TCP and UDP client-server programs - BOOTP -DHCP - DNS - name space, resolution - types of records - concept - mode of operation - Rlogin.

TOTAL PERIODS:45

TEXT BOOKS:

1. Behrouz A. Forouzan, "TCP/IP Protocol Suite", 4th edition, McGraw Hill, 2013.
2. Douglas E. Comer, "Internetworking with TCP/IP: principles, protocols and architecture" (Volume1), 6th Edition, PHI Learning, 2013.

REFERENCES:

1. Douglas E. Comer, David L. Stevens, "Internetworking with TCP/IP, design, implementation and internals Volume 2, 3rd Edition, PHI Learning, 2009.
2. Ed Tittel, Laura Chappell, "TCP/IP", 1st Edition, Cengage Learning, 2008.
3. Dr. SidnieFeit, TCP/IP, architecture, protocols and implementation with IPv6 and IP Security, Tata McGraw-Hill, 2008.

MCS96 WIRELESS NETWORKING AND MOBILE COMPUTING

L	T	P	C
3	0	0	3

Course Objectives:

- Data communications and resource management,
- Network protocols and distributed computing,
- Information management, user interfaces, applications/services, and security.

Course Outcomes:

On successful completion of this module, the student should:

CO1: Have knowledge and understanding of basic mobile network architecture
CO2: Have knowledge and understanding of some basic technologies that are in use
CO3: Be able to make critical assessment of mobile systems
CO4: Be able to analyze and propose broad solutions for a range of mobile scenarios

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S	S								S
CO2	S	M	S	S						M		S
CO3	S		S	S					M			S
CO4	S	M	S	S								S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

Wireless transmission – Frequencies for radio transmission, signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular system Telecommunication systems – GSM, Digital enhanced cordless telecommunications (DECT)

UNIT II **9**

Wireless Medium Access control and CDMA- based communication – Medium access control, Introduction to CDMA-based systems, Spread spectrum in CDMA systems, coding methods in CDMA.

UNIT III **9**

Wireless LAN – Infra red vs radio transmission, infrastructure and ad hoc networks, IEEE 802.11, Bluetooth.

UNIT IV **9**

Mobile network layer – Mobile IP, Dynamic host configuration protocol, Mobile ad-hoc networks, Wireless sensor networks 6. Mobile transport layer – Traditional TCP, Classical TCP improvements, snooping TCP, Mobile TCP, TCP over 2.5/3G wireless networks.

UNIT V **9**

Mobile internet connectivity – WAP 1.1, Layers of WAP, Wireless Application Environment, WML and WML Script , wireless telephony application, WAP 2.0 architecture , XHTMLMP(Extensible Hypertext Markup Language Mobile profile) Mobile Operating System ,Mobile file system, Security in mobile computing, Wireless network simulator such as NS2.

TOTAL PERIODS:45

TEXT BOOKS:

1. Raj Kamal," Mobile Computing" ,Oxford, 209.
2. Jochen Schiller ,"Mobile Communication",Pearson Education, ,2009

REFERENCES:

1. Asoke K. Talukdar,"Mobile Computing", 2nd edition, Tata McGrawHill,2010.
2. Stojmenovic," Handbook of Wireless Networks and Mobile Computing",Wiley ,2006.

MCS 97 INFORMATION RETRIEVAL TECHNIQUES

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the basics of Information Retrieval with pertinence to modelling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering
- To understand the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search
- To understand the concepts of digital libraries

Course Outcomes:

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

CO1: Build an Information Retrieval system using the available tools
CO2: Identify and design the various components of an Information Retrieval system
CO3: Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
CO4: Analyze the Web content structure
CO5: Design an efficient search engine

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		M							S		S
CO2			S	S						M		S
CO3	S		S	M						S		M
CO4			S							M		S
CO5	S		M	M						S		S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6. End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT IINTRODUCTION: MOTIVATION **9**

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – RetrievalEvaluation – Open Source IR Systems–History of Web Search – Web

Characteristics–The impact ofthe web on IR —IR Versus Web Search–Components of a Search engine

UNIT II

MODELING **9**

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting –Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – AlgebraicModels – Structured Text Retrieval Models – Models for Browsing.

UNIT III

INDEXING **9**

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching -Sequential Searching and Pattern Matching. Query Operations -Query Languages – QueryProcessing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis –Measuring Effectiveness and Efficiency

UNIT IV

TEXT CLASSIFICATION AND NAIVE BAYES **9**

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines andMachine learning on documents. Flat Clustering – Hierarchical Clustering Matrix decompositions andlatent semantic indexing – Fusion and Meta learning

UNIT V SEARCHING THE WEB **9**

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – WebCrawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages –Indexing and Searching Parallel and Distributed IR – Digital Libraries

TOTAL PERIODS: 45

TEXT BOOKS:

1. Ricardo Baeza – Yates, BerthierRibeiro – Neto, “Modern Information Retrieval: The concepts and Technology behind Search “,ACM Press Books, Second Edition 2011.
2. Ricardo Baeza – Yates, BerthierRibeiro – Neto, “Modern Information Retrieval”, Pearson Education, Second Edition, 2005.

REFERENCES:

1. Christopher D. Manning, PrabhakarRaghavan, HinrichSchutze, “Introduction to Information Retrieval”, Cambridge University Press, First South Asian Edition 209.
2. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, “Information Retrieval Implementing and Evaluating Search Engines”, The MIT Press, 2010.

MCS98 TEXT DATA MINING

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the basic issues and types of text mining
- To appreciate the different aspects of text categorization and clustering
- To understand the role played by text mining in Information retrieval and extraction
- To appreciate the use of probabilistic models for text mining
- To appreciate the current trends in text mining

Course Outcomes:

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

CO1: Identify the different features that can be mined from text and web documents.

CO2: Use available open source classification and clustering tools on some standard text data sets

CO3: Modify existing classification/clustering algorithms in terms of functionality or features used

CO4: Design a system that uses text mining to improve the functions of an existing open source search engine

CO5: Implement a text mining system that can be used for an application of your choice

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S						M			S
CO2	S		S		M						M	S
CO3	S	M	S	M			M					S
CO4	M		M									S
CO5	S		S	M								S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

INTRODUCTION

Overview of text mining- Definition- General Architecture– Algorithms– Core Operations – Preprocessing–Types of Problems- basics of document classification- information retrieval-clustering and organizing documents- information extraction- prediction and evaluation-Textual information tonumerical vectors -Collecting documents- document standardization-tokenization- lemmatizationvectorgeneration for prediction- sentence boundary determination -evaluation performance.

UNIT II

TEXT CATEGORIZATION AND CLUSTERING 9

Text Categorization – Definition – Document Representation –Feature Selection - Decision TreeClassifiers - Rule-based Classifiers - Probabilistic and Naive Bayes Classifiers - Linear Classifiers-Classification of Linked and Web Data - Meta-Algorithms– Clustering – Definition- Vector SpaceModels - Distance-based Algorithms- Word and Phrase-based Clustering -Semi-SupervisedClustering - Transfer Learning

UNIT III

TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION EXTRACTION 9

Information retrieval and text mining- keyword search- nearest-neighbour methods- similarity- webbaseddocument search- matching- inverted lists- evaluation. Information extraction- Architecture -Co-reference - Named Entity and Relation Extraction- Template filling and database construction –Applications.Inductive -Unsupervised Algorithms for Information Extraction. Text SummarizationTechniques - Topic Representation - Influence of Context - Indicator Representations – PatternExtraction - Apriori Algorithm – FP Tree algorithm

UNIT IV

PROBABILISTIC MODELS 9

Probabilistic Models for Text Mining -Mixture Models - Stochastic Processes in BayesianNonparametric Models - Graphical Models - Relationship Between Clustering, Dimension Reductionand Topic Modelling - Latent Semantic Indexing - Probabilistic Latent Semantic Indexing –LatentDirichlet Allocation- Interpretation and Evaluation - Probabilistic Document Clustering and TopicModels - Probabilistic Models for Information Extraction - Hidden Markov Models - Stochastic Context-Free Grammars - Maximal Entropy Modelling - Maximal Entropy Markov Models -Conditional RandomFields.

UNIT V RECENT TRENDS 9

Visualization Approaches - Architectural Considerations - Visualization Techniques in Link Analysis -Example- Mining Text Streams - Text Mining in Multimedia - Text Analytics in Social Media – OpinionMining and Sentiment Analysis - Document Sentiment Classification Opinion Lexicon Expansion -Aspect-Based Sentiment Analysis - Opinion Spam Detection Text Mining Applications and Casestudies.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau “The Text Mining Handbook:
2. Advanced Approaches in Analyzing Unstructured Data”, Springer, paperback 2010.

REFERENCES:

1. Charu C. Aggarwal ,ChengXiangZhai**, "**Mining Text Data", Springer; 209.
2. Ronen Feldman, James Sanger -" The Text Mining Handbook: Advanced Approaches inAnalyzing Unstructured Data",Cambridge University press, 2006.

MCS99 WEB DATA MINING

L	T	P	C
3	0	0	3

Course Objectives:

- To focus on a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining
- To Understand the basics of Information retrieval and Web search with special emphasis on webCrawling
- To appreciate the use of machine learning approaches for Web Content Mining
- To understand the role of hyper links in web structure mining
- To appreciate the various aspects of web usage mining

Course Outcomes:

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

CO1: Build a sample search engine using available open source tools
CO2: Identify the different components of a web page that can be used for mining
CO3: Apply machine learning concepts to web content mining
CO4: Implement Page Ranking algorithm and modify the algorithm for mining information
CO5: Process data using the Map Reduce paradigm
CO6: Design a system to harvest information available on the web to build recommender systems
CO7: Analyze social media data using appropriate data/web mining techniques
CO8: Modify an existing search engine to make it personalized

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S	M	S							S
CO2	S		S		M			M				S
CO3	M		S									S
CO4	S	M	S						M			S
CO5	S		S		M							S
CO6	S		S								M	S
CO7	S	M	S	M								M
CO8	S		S									S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

INTRODUCTION

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rulemining – Sequential Pattern Mining -Information retrieval and Web search – Information retrievalModels-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent SemanticIndexing – Web Search – Meta-Search – Web Spamming

UNIT II **9**

WEB CONTENT MINING

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification -Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering -Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-BasedClustering - Evaluating Classification and Clustering – Vector Space Model – Latent semanticIndexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – DocumentSentiment Classification

UNIT III **9**

WEB LINK MINING

Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co Citationand Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search –EnhancedTechniques for Page Ranking - Community Discovery – Web Crawling -A Basic CrawlerAlgorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers-Evaluation - Crawler Ethics and Conflicts - New Developments

UNIT IV **9**

STRUCTURED DATA EXTRACTION

Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance-BasedWrapper Learning ·- Automatic Wrapper Generation: Problems - String Matching and Tree Matching -.Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiplepages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-LevelMatching – Extracting and Analyzing Web Social Networks.

UNIT V

WEB USAGE MINING **9**

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing - Cleaning and Filtering- Data Modelling for Web Usage Mining - The BIRCH ClusteringAlgorithm -Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of WebUsage Patterns – Modelling user interests –Probabilistic Latent Semantic Analysis – Latent DirichletAllocation Model– Applications- Collaborative Filtering- Recommender Systems – Web Recommendersystems based on User and Item – PLSA and LDA Models.

TOTAL PERIODS:45

TEXT BOOKS:

1. GuandongXu ,Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and Applications", Springer; 1st Edition.2010.
1. Bing Liu, " Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-2entric Systems and Applications)", Springer; 2nd Edition 2009.
2. Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007.

REFERENCES:

1. Min Song, Yi Fang and Brook Wu, "Handbook of research on Text and Web mining technologies", IGI global, information Science Reference – imprint of :IGI publishing, 2008.
2. Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc ,2005.
3. SoumenChakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002.

MCS130 SOCIAL NETWORK ANALYSIS

L	T	P	C
3	0	0	3

Course Objectives:

- To gain knowledge about the current Web development and emergence of Social Web.
- To study about the modelling, aggregating and knowledge representation of Semantic Web.
- To learn about the extraction and mining tools for Social networks.
- To gain knowledge on Web personalization and Web Visualization of Social networks.

Course Outcomes:

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

CO1: To apply knowledge for current Web development in the era of Social Web.

CO2: To model, aggregate and represent knowledge for Semantic Web.

CO3: To design extraction and mining tools for Social networks.

CO4: To develop personalized web sites and visualization for Social networks.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1			S	S	M		M	S		M		
CO2		M	S	S			S	M				
CO3			S	M			M	S		M		
CO4			S	S			S	M		M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

INTRODUCTION TO SOCIAL NETWORK ANALYSIS

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence ofthe Social Web - Network analysis - Development of Social Network Analysis- Key concepts and measures in network analysis - Electronic sources for network analysis - Electronic discussionnetworks, Blogs and online communities, Web-based networks - Applications of Social NetworkAnalysis.

UNIT II **9**

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology and their role in the Semantic Web - Ontology-based Knowledge Representation – Ontologylanguages for the Semantic Web – RDF and OWL - Modelling and aggregating social network data -State-of-the-art in network data representation, Ontological representation of social individuals,Ontological representation of social relationships, Aggregating and reasoning with social networkdata, Advanced Representations.

UNIT III **9**

EXTRACTION AND MINING COMMUNITITES IN WEB SOCIAL NETWROKS

Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities inSocial Networks - Definition of Community - Evaluating Communities - Methods for CommunityDetection & Mining - Applications of Community Mining Algorithms - Tools for Detecting CommunitiesSocial Network Infrastructures and Communities - Decentralized Online Social Networks- Multi-Relational Characterization of Dynamic Social Network Communities.

UNIT IV **9**

PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

Understanding and Predicting Human Behaviour for Social Communities - User Data Management,Inference and Distribution - Enabling New Human Experiences - Reality Mining - Context-Awareness- Privacy in Online Social Networks - Trust in Online Environment - Trust Models Based on SubjectiveLogic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation – TrustDerivation Based on Trust Comparisons - Attack Spectrum and Countermeasures.

UNIT V **9**

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, VisualizingOnline Social Networks, Visualizing Social Networks with Matrix-Based Representations- Matrix +Node-Link Diagrams, Hybrid Representations - Applications - Covert Networks - Community Welfare -Collaboration Networks - Co-Citation Networks.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 1st edition, 2011.
2. BorkoFurht, “Handbook of Social Network Technologies and Applications”, Springer,
3. 1st edition, 2010.
4. Peter Mika, “Social networks and the Semantic Web”, Springer, 1st edition 2007.

REFERENCES:

1. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and social information retrieval and access: techniques for improved user modelling”, IGI Global snippet, 2009.
2. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer,2009.
3. Dion Goh and Schubert Foo, “Social information retrieval systems: emerging technologies and applications for searching the Web effectively”, IGI Global snippet, 2008.

MCS131 DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

Course Objectives:

- This course will introduce the basic concepts and techniques for processing signals on a computer.
- By the end of the course, you be familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Outline the characteristics of discrete-time signals and discrete systems

CO2: Analyze signal / system properties using mathematical tools

CO3: Apply and develop algorithms for digital systems

CO4: Illustrate efficient computation of DFT

CO5: Explain the advanced features and architecture of generic P-DSP

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S	S								
CO2	S	M	S	S			M					
CO3	S	M	M	S				M				
CO4	S	M	S	S								
CO5	M		S	S				S				

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS : 9

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms. Time response and frequency response analysis of discrete time systems to standard input signals.

UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS: 9

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS: 9

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and BlackmannWindows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.

UNIT IV FINITE WORD LENGTH EFFECTS **9**

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representations – Comparison – Overflow error – truncation error – coefficient quantization error – limit cycle oscillations- signal scaling – analytical model of sample and hold operations.

UNIT V SPECIAL TOPICS IN DSP: **9**

Discrete Random Signals- Mean, Variance, Co-variance and PSD – Periodiogram Computation – Principle of Multi rate DSP – decimation and Interpolation by integer factors – Time and frequency domain descriptions – Single, Multi stage, polyphase structures – QMF filters – Subband Coding

TOTAL PERIODS: 45

TEXT BOOKS:

1. Alan V Oppenheim, Alan S. Willsky, Hamid Nawab, "Signals & Systems", Pearson Education, 2nd Edition ,2000.
2. John Proakis, Dimitris G Manolakis, "Digital Signal Processing Principles, Algorithms and Application", PHI, 3rd Edition ,2000.

REFERENCES:

1. S.K. Mitra, "Digital signal processing-A Computer based approach", Tata McGraw-Hill, 3rd Edition,2004.
2. Simon Haykin and Barry Van Veen, "Signals & Systems", John Wiley and Sons, 2nd Edition,2002.
3. S. Salivahana, A.Vallavaraj, Gnanapriya, "Digital Signal Processing", McGraw-Hill, 2nd Edition,2000.

MCS 132 IMAGE PROCESSING

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the basic concepts of digital image processing and various image transforms.
- To familiarize the student with the image processing facilities in MAT Lab
- To expose the student to a broad range of image processing techniques and their applications, and to provide the student with practical experience using them.
- To appreciate the use of current technologies those are specific to image processing systems.
- To expose the students to real-world applications of image processing.

Course Outcomes:

On successful completion of this course, students should be able to

CO1: Upon Completion of the course, the students Should have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.

CO2: Implement basic image processing algorithms using MATLAB tools.

CO3: Explore advanced topics of Digital Image Processing.

CO4: Ability to Apply and develop new techniques in the areas of image enhancement-restoration segmentation- compression-wavelet processing and image morphology.

CO5: Make a positive professional contribution in the field of Digital Image Processing.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S		S	S							
CO2	S	S	S	S	M							
CO3	M	M		M								
CO4	S	M		S	M							
CO5	S	S		M	M							

Course Assessment methods

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS 9

Introduction – Steps in Digital Image Processing – Image sampling and Quantization – Basic Relationships between pixels – Color Fundamentals – File Formats – Image Transforms: DFT, DCT,Haar, SVD and KL- Introduction to Matlab Toolbox.

UNIT II

IMAGE ENHANCEMENT AND IMAGE RESTORATION 9

Image Enhancement in the Spatial Domain: Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, SpatialFiltering , Fuzzy sets for spatial filters – Image Enhancement in the Frequency Domain: Frequency Domain Filters – Image Restoration: Model of Image Degradation/Restoration Process, Noise Models, Linear and non linear image restoration techniques, Blind Deconvolution.

UNIT III

MULTI RESOLUTION ANALYSIS AND IMAGE COMPRESSION 9

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Fast Wavelet Transforms, Lifting scheme. Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression-wavelet based image compression techniques – Compression standards-JPEG/MPEG, Video compression.

UNIT IV 9

IMAGE SEGMENTATION AND DESCRIPTION

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Basic Morphological Algorithms, MorphologicalWaterSheds - Description: Boundary Descriptors, Regional Descriptors.

UNIT V 9

CURRENT TRENDS AND APPLICATIONS OF IMAGE PROCESSING

Applications: Image Classification, Object Recognition, Image Fusion, Steganography – CurrentTrends: Color Image Processing, Wavelets in Image Processing.

TOTAL PERIODS: 45

TEXT BOOKS:

1. 1.S. Sridhar, "Digital Image Processing", Oxford University Press, 2011.
2. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Pearson Education, 3rd Edition, 2008.
3. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI, 2006.

REFERENCES:

1. Rafael C.Gonzalez, Richard E.Woods, and Eddins, "Digital Image Processing Using MATLAB",Tata McGraw-Hill, 2nd Edition, 2009.
2. Sanjit K. Mitra, & Giovanni L. Sicuranza, "Non Linear Image Processing", Elsevier, 2007.

MCS 133 PATTERN RECOGNITION TECHNIQUES

L	T	P	C
3	0	0	3

Course Objectives:

- To study the fundamental algorithms for pattern recognition.
- To instigate the various classification techniques.
- To originate the various structural pattern recognition and feature extraction techniques

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Summarize on supervised and unsupervised classification methods for various pattern recognition problems.

CO2: Identify appropriate clustering techniques for various problems with high dimensional data.

CO3: Explain about various structural pattern recognition models.

CO4: Outline feature extraction and subset selection methods for various applications.

CO5: Explain about the neural networks for pattern recognition problems and Fuzzy Pattern Classifiers.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S		S								
CO2	S	S	S	S								
CO3	M	M		M								
CO4	S	M		S								
CO5	S	S		M								

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT –I

PATTERN CLASSIFIER **9**

Overview of Pattern Recognition-Discriminate Functions-Supervised Learning-Parametric Estimation-Maximum Likelihood Estimation-Bayesian Parameter Estimation-Perception Algorithm-LNSE Algorithm-Problems with Bayes Approach-Pattern Classification by Distance Functions-Minimum Distance Pattern Classifier.

UNIT – II

UNSUPERVISED CLASSIFIER **9**

Clustering for Unsupervised Learning and Classification-Clustering Concept-C Means Algorithm-Hierarchical Clustering Procedures-Graph Theoretic Approach to Pattern Clustering-Validity of Clustering Solutions.

UNIT – III

STRUCTURAL PATTERN RECOGNITION **9**

Elements of Formal Grammars-String Generation as Pattern Description-Recognition of Syntactic Description-Parsing-Stochastic Grammars and Applications-Graph Based Structural Representation.

UNIT – IV

FEATURE EXTRACTION AND SELECTION **9**

Entropy Minimization-Kahunen-Loeve Transformation-Feature Selection through functions Approximation-Binary Feature Selection.

UNIT –V

RECENT ADVANCES **9**

Neural Network Structures for Pattern Recognition-Neural Network based Pattern Associators-Unsupervised Learning in Neural Pattern Recognition-Self Organizing Networks-Fuzzy Logic-Fuzzy Pattern Classifiers-Pattern Classification using Genetic Algorithms.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Ariel,Franscisco,Kittler“ Advances in Pattern recognization,Springer,2010.
2. Robert J. Schalkoff, “Pattern Recognition: Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., New York, 2007.

REFERENCES:

1. Christopher M.Bishop,”Pattern Recognition and Machine Learning”,Springer,2006.
2. DudaR.O , Hart P.E., “Pattern Classification”, Wiley, 2001.

MCS134 MULTIMEDIA SYSTEMS

L	T	P	C
3	0	0	3

Course Objectives:

- To present a step-by-step approach to multimedia systems design.
- To introduce multimedia standards and compression and decompression technologies.
- To provide a detailed analysis of the various storage technologies.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Understand different realizations of multimediatools and their usage.

CO2: Implement various multimedia standards and compression technologies.

CO3: Analyze various storage technologies.

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1			M		M					S		S
CO2					S		M			M		S
CO3	M				S					S	M	M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

Introduction: Motivation, evolution of multimedia, structure and components of multimedia, application domain, Internet and multimedia, hypertext, hypermedia, browser and helper application overview, user interface design issues.

UNIT -II **9**

Sound and Audio Technology

Psychoacoustics: frequency and amplitude sensitivity of hearing, music and noise, stereo effects, masking; Frequency domain compression of analog signal, digitization of audio signal: sampling and coding, digital audio signal processing, architecture of sound card, electronic music and synthesizer, MIDI: Interface, protocol and data format.

UNIT -III **9**

Image and Graphics: Principles of raster graphics: visual display concept, resolution, colors and pallets, refresh rate and graphics accelerators; digital image representation and format, graphic drafting tools, image enhancement, colour printer principles, image scanner principles, digital still camera principles, file formats.

UNIT-IV **9**

Video Technology: Analog video principles and broadcast standards, CCD Camera, recording formats and standard; digital video principles, TV cards, frame grabber principles, IDTV and HDTV principles Animation and Special Effects: History of animation, animation principles, animation techniques, shockwave animation, survey of animation tools and file formats, special visual effects.

UNIT -V **9**

Storage Media: Magnetic media principles and storage density, principles of CD technology: CDROM, CDRW and CDDA format and principles, IDE, SCSI and USB interfaces to storage devices. Data Compression: Information theory based and frequency domain based compression, basic compression techniques (DPCM,RLE, Huffman Coding etc), JPEG/ISO, H261,H263, MPEG-1,2,4,7, DVI. Multimedia Document Interchange Formats: Hypertext, HTML, MHEG, SGML, Open Document Architecture, Open Media Framework. Authoring Tools and Metaphors: Authoring tools: Productivity and Creativity, survey of authoring tools: book metaphor, slideshow metaphor, time-line metaphor, network and icon metaphor.

TOTAL PERIODS: 45

TEXT BOOKS:

1. TayVahun,"Multimedia Making It Work, Eighth Edition, Tata McGraw Hill,2010.
2. R. Steinmetz and K.Nashtedt, "Multimedia Computing, Communication& Applications",PHI,2009.

REFERENCES:

1. Vic Costello, "Multimedia Foundations",British Library209.
2. Buford K., "Multimedia Systems", Pearson Education,2010.

L	T	P	C
3	0	0	3

MCS135 SECURITY PRINCIPLES AND PRACTICES

Course Objectives:

- To understand the mathematical foundations of security principles
- To appreciate the different aspects of encryption techniques
- To understand the role played by authentication in security
- To appreciate the current trends security practices

Course Outcomes:

CO1: Understand different realizations of *multimedia*tools and their usage.

CO2: Implement various multimedia standards and compression technologies.

CO3: Analyze various storage technologies.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1			M		M							
CO2							M			M		
CO3	M										M	

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

NIT I **9**

INTRODUCTION AND MATHEMATICAL FOUNDATION

An illustrative communication game – safeguard versus attack – Probability and Information Theory -Algebraic foundations – Number theory.

UNIT II **9**

ENCRYPTION – SYMMETRIC TECHNIQUES

Substitution Ciphers – Transposition Ciphers – Classical Ciphers – DES – AES – Confidentiality Modes of Operation – Key Channel Establishment for symmetriccryptosystems.

UNIT III **9**

ENCRYPTION – ASYMMETRIC TECHNIQUES AND DATA TECHNIQUES

Diffie-Hellman Key Exchange protocol – Discrete logarithm problem – RSAcryptosystems & cryptanalysis – ElGamal cryptosystem – Need for stronger Security Notions forPublic key Cryptosystems – Combination of Asymmetric and Symmetric Cryptography – KeyChannel

Establishment for Public key Cryptosystems - Data Integrity techniques – Symmetric techniques - Asymmetric techniques.

UNIT IV

AUTHENTICATION **9**

Authentication Protocols Principles – Authentication protocols for Internet Security – SSH Remote logic protocol – Kerberos Protocol – SSL & TLS – Authentication frame for public keyCryptography – Directory Based Authentication framework – Non - Directory Based Public-KeyAuthentication framework.

UNIT V

SECURITY PRACTICES **9**

Protecting Programs and Data – Information and the Law – Rights of Employees and Employers– Software Failures – Computer Crime – Privacy – Ethical Issues in Computer Security.

TOTAL PERIODS: 45

TEXT BOOKS:

1. William Stallings, "Crpyptography and Network security: Principles and Practices", Pearson/PHI, 5th Edition, 2010.
2. Behrouz A. Forouzan, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill Education, 2010.
3. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd Edition, Pearson, 2007.
4. Douglas R. Stinson ,"Cryptography Theory and Practice ", 3rd Edition, Chapman & Hall/CRC, 2006.

REFERENCES:

1. Charlie Kaufman, Radia Perlman and Mike Speciner, " Network Security Private Communication in a Public World", PHI, Second Edition, 209.
2. W. Mao, "Modern Cryptography Theory and Practice", Pearson Education, 2nd Edition, 2007.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in computing", 3rd Edition, Prentice Hall of India, 2006.
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, 2006.

MCS136 ADVANCED WEB DESIGN

L	T	P	C
3	0	0	3

Course Objectives:

- To build web applications using ASP and client side script technologies use with Microsoft's IIS.
- To build XML applications with DTD and style sheets that span multiple domains ranging from finance to vector graphics to genealogy for use with legacy browsers.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Create richly interactive environments natively within browsers.
CO2: Build web application frameworks which facilitate rapid application development.
CO3: Integrate web applications easily into other server-side web procedures, such as email and searching.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S				M		M			
CO2	S		S		M					M	S	
CO3	S		M		M					M		S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT - I
FUNDAMENTALS **9**
Introduction to the Web-Web enabling Technologies-Web Service Protocol-web Design Concepts- Examining Good and Bad Web Design-Page Design Resources.

UNIT – II
SIMPLE DESIGN ISSUES **9**
Page Design-HTML-Web Page Style Considerations-Page composition-Type Faces-Tag Parameters-Color and Graphics for web Pages-WYSIWYG web Page Editor-Dream Weaver.

UNIT - III
ADVANCE DESIGN ISSUES **9**
Advanced Page Design-Tables and Frames-Preparing Graphics and animations Forms-Cascading Sheets-User interface Design-Page grid-Page Templates-Usability Testing.

UNIT - IV
SCRIPTING IN DESIGN **9**
Typography and Graphic Design for the Web-Creating Transparent GIP- Lean Graphics-Image Maps-Palette Map-web Programming-Web Site Garage-W3C HTML Validation Services-Net Mechanic-DHTML-XML.

UNIT - V
TOOLS AND APPLICATIONS **9**

Online Applications-Developing an Online Shopping application-Database Design Issues-Connecting Database with tools such as Java, ASP, Cold fusion-Designing Portals and Vortals.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Deitel and Deitel, "Internet and World Wide Web-How to Program", 3rd Edition, Pearson Education, 2005.

REFERENCES:

1. N.P.Gopalan&J.Akilandeswari, "Web Technology: A Developer's Perspective", PHI Learning,2008.
2. Jeff Frantzen and Sobotka, "Java Script", Tata McGraw Hill, 2002.
3. Justin Hunter,William Crawford, "Java Servlet Programming", O'Reilly Publications, 2nd Edition, 2001.
4. DHTML, O' Reiley Publications, 2000.

MCS137 E-COMMERCE

L	T	P	C
3	0	0	3

Course Objectives:

- To have an awareness about role of IT in business.
- To have knowledge of basic concepts of ecommerce.
- To have in depth knowledge in security and legal issues in ecommerce.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Create and refine website and application designs based on industry's usability standards.

CO2: Assess the suitability of various design principles for websites and applications

CO3: Apply the skills necessary for large-scale project development on the Web

CO4: Apply the technologies required to design and prototype Web-based information systems.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S	S	M				M	S		M
CO2		M			S		S			S		S
CO3		S			M					M		S
CO4	S				S					M	M	S

Course Assessment methods:

Direct	Indirect
1. Internal Tests	1.Course & Survey

2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	2. Faculty Survey 3.Industry 4.Alumni

UNIT-I **9**

ELECTRONIC COMMERCE

Electronic Commerce, Electronic Data Interchange (EDI), E-Commerce Types – PC and networking: Networking, Communication media – Computer Communication Systems: ISO model, Electronic mail, X.400 Message Handling System, E-mail security, Light weight directory access protocol – Internet: Introduction, Communication protocols, Issues of concern.

UNIT-II **9**

ELECTRONIC DATA INTERCHANGE

EDI: Introduction, Cost and Benefits, Components of EDI System, Implementation Issues – UN/EDIFACT Standard: Introduction, An EDIFACT Message, Interchange Structure, Message Directories - EDI Over Internet, Commerce Over Extranets, Identification and Tracking Tools.

UNIT-III **9**

REENGINEERING

Business process reengineering – Approach to BPR, BPR methodology – Change management: Change management in the Government, Implementation plan.

CONCERNS FOR E-COMMERCE GROWTH

Legal issues, Risks: Paper document versus electronic document, Technology for authenticating an electronic document, Laws for e-commerce, EDI interchange agreement.

UNIT-IV **9**

CYBER SECURITY: Cyber Attacks, Hacking, Firewalls, IDS, Secure Sockets Layer, Symmetric and asymmetric crypto systems, Guidelines for Cryptography Policy, Developing a Security Policy. **CYBER CRIMES:**Cybercrimes and the Information Technology Act, 2000, Cyber forensics.

UNIT-V **9**

CASE STUDIES

E-Commerce: Case Studies: ITC's e-Choupal - E-Governance: Case Studies: Indian customs EDI System, Indian Railways, Government of Andhra Pradesh – eSeva.

COMPUTER EMERGENCY RESPONSE TEAM (CERT): Introduction, CERT-In, CERT-In Activities

TOTAL PERIODS: 45

TEXT BOOKS:

1. Kamlesh K Bajaj, Debjani Nag, "E-Commerce – The Cutting Edge of Business", Tata McGraw Hill, Second Edition, 2006.

2. David Whitley, “E-Commerce: Strategy, Technologies and applications”, McGraw Hill, 2000.

REFERENCE:

1. Ravi Kalakota and Andrew B.Whinston, “Frontiers of Electronic commerce”, Pearson Education, 2005.

L	T	P	C
3	0	0	3

MCS138 SPEECH RECOGNITION

Course Objectives:

- At the end of the course the students would be able to
- Understand the fundamentals of speech processing
- Understand the basics of Speech Models

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Students understand the advanced features of databases in design, administration, and applications

CO2: Aspires to improve the performance of a database

CO3: Students learn about optimization of existing resources usage within the database environment.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1		M	M				M			S		M
CO2		M	S		M		M			S		S
CO3					M					M		S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I

FUNDAMENTALS OF SPEECH PROCESSING

9

Introduction to Speech processing - applications - Fundamentals of speech processing - Analysis tools - z - Fourier - DFT transforms - FIR - IIR filters - sampling.

UNIT- II **9**

SPEECH MODELS

Digital models - Vocal tract analog and digital models - Time Domain models - Useful Performance measures - zero - crossings - voiced - unvoiced - pitch periods - correlation Functions - smoothing.

UNIT III **9**

DIGITAL REPRESENTATION AND ANALYSIS

Digital representations of speech waveform - Encoding of speech using delta modulation - PCM - differential PCM - other systems - Short-time Fourier analysis - Short term analysis Effects - filter banks - pitch detection - vocoders.

UNIT- IV **9**

HOMOMORPHIC SPEECH PROCESSING AND LINEAR PREDICTIVE CODING

Homomorphic speech processing - Cepstrum - pitch detection - formant estimation - vocoders - Linear predictive coding of speech - LPC methods and parameters - relations between speech parameters.

UNIT -V **9**

DIGITAL SPEECH PROCESSING AND RECOGNITION

Digital speech processing for man - machine communication by voice - Speech and speaker recognition - voice response systems.

TOTAL PERIODS: 45

TEXT BOOKS :

1. Amy Neustein,"Advances in Speech Recognition"Springer,2010.
2. Claudio,Klucio,"Speech Recognition",Wiley 2008

REFERENCES:

1. Dorothea Kolossa, Reinhold Haeb-Umbach,,"Robust Speech Recognition of Uncertain or Missing Data: Theory and Applications", Springer,2011.
2. Wai C.Chu, "Speech Coding Algorithm", Wiley, 2004.

MCS139 MULTICORE ARCHITECTURE

L	T	P	C
3	0	0	3

Course Objectives:

- Review theoretical background covering multicore processor architecture, concurrent programming, and parallel programming concepts and considerations.
- Cover critical concepts such as implicit and explicit parallelism, atomicity, synchronization, shared memory, cache coherency, Amdahl's Law, Flynn's processor classifications, and Little's law in detail.
- Recognize the best parallelism opportunities and explain the advantages of using threads to obtain concurrency using various analysis techniques, compositional approaches, and parallel design patterns.

- Learn how to avoid synchronization pitfalls such as starvation, deadlock, live lock, and data races.

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Understand and use threads with specific technologies and programming methods, such as the Windows API, POSIX pthreads, Intel TBB, and OpenMP using C/C++ and the Intel Compiler.

CO2: Gain hands-on experience with the Intel Compiler to build and run multithreaded programs during the laboratories.

CO3: Learn best practices to deal with MT-unsafe libraries and how to write new thread-safe libraries.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	M	S		S	S	M				M		M
CO2		S	M					M				
CO3		S		M		M					M	M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

Fundamentals of SuperScalar Processor Design, Introduction to Multicore Architecture – Chip Multiprocessing, homogeneous Vs heterogeneous design - SMP – Multicore Vs Multithreading.

UNIT -II **9**

Shared memory architectures– synchronization – Memory organization – Cache Memory – Cache Coherency Protocols - Design of Levels of Caches.

UNIT- III **9**

Multicore programming Model – Shared memory model, message passing model, transaction model – OpenMP and MPI Programming.

UNIT -IV **9**

PowerPC architecture – RISC design, PowerPC ISA, PowerPC Memory Management Power 5 Multicore architecture design, Power 6 Architecture.

UNIT -V **9**

Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element), Cell Software Development Kit, Programming for Multicore architecture.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press,2006.
2. Wesley Petersen and Peter Arbenz, "Introduction to Parallel Computing", Oxford University Press, 2004.

REFERENCES:

1. John L. Hennessey and David A. Patterson, " Computer architecture – A quantitative approach", Morgan Kaufmann/Elsevier Publishers, 4th edition, 2007.
2. 2.David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture : A hardware/ software approach" , Morgan Kaufmann/Elsevier Publishers, 2004.
3. .Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.

MCS140 STOCHASTIC PROCESSES & QUEUEING THEORY

L	T	P	C
3	0	0	3

Course Objectives:

- To impart knowledge on probability concepts to study their applications in stochastic processes &queuing theory

Course Outcomes:

After successful completion of this course, students should be able to

CO1: Compute the characteristics of the random variable given the probabilities
CO2: Understand and apply various distribution
CO3: Solve cases of different Stochastic processes along with their properties.
CO4: Use discrete time finite state Markov chains
CO5: Gain sufficient knowledge in principles of queuing theory

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S		S				M				S
CO2	S	S		S								M
CO3	S	S		S	M							S
CO4	S	S		S					M			M
CO5	S	S		S		M						S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar	1.Course & Survey 2. Faculty Survey 3.Industry

4.Online Test 5.Quiz 6.End Semester Exam	4.Alumni

UNIT I **9**

RANDOM VARIABLES

One dimensional and two dimensional Random Variables – Characteristics of Random Variables: Expectation, Moments.

9

UNIT II

THEORETICAL DISTRIBUTIONS

Discrete : Binomial, Poisson, Negative Binomial, Geometric, Uniform Distributions. Continuous: Uniform, Exponential, Erlang and Gamma, Weibull Distributions.

UNIT III **9**

STOCHASTIC PROCESSES

Classification of Stochastic Processes – Bernoulli process – Poisson process – Pure birth process – Birth and Death process.

UNIT IV

MARKOV CHAINS **9**

Introduction – Discrete-Parameter Markov Chains – Transition Probability Matrix – Chapman Kolmogorov Theorem – State classification and limiting distributions.

UNIT V **9**

QUEUING THEORY

Introduction – Characteristics of Markovian Single server and Multi server queuing models [(M/M/1) : (∞ / FIFO), (M/M/1) : (N / FIFO), (M/M/s) : (∞ /FIFO)] – M/G/1 Queuing System – PollaczekKhinchin formula.

TEXT BOOKS:

1. Kishore.S.Trivedi, "Probability & Statistics with Reliability, Queuing and Computer Science Applications", PHI, New Delhi, 2008.
2. Veerajan T, "Probability, Statistics and Random Processes", 3rd Edition Tata McGraw Hill, New Delhi, 2008.

REFERENCES:

1. Sundarapandian, "Probability, Statistics and Queuing Theory", PHI,2009.
2. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", 9th revised edition, Sultan Chand & Co., New Delhi 2003.

MCS141 REAL TIME SYSTEMS DESIGN

L	T	P	C
3	0	0	3

Course Objectives:

- To learn real time operating system concepts and the associated issues & techniques.
- To explain and apply the fundamental concepts and terminology of real-time systems;

- To explain and address the fundamental problems of real-time systems;
- To analyze real-time systems designs;
- To design a real-time system (at least partially); and
- To identify and assess the relevant literature and research trends of real-time systems.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To present the mathematical model of the system.

CO2: To develop real-time algorithm for task scheduling.

CO3: To understand the working of real-time operating systems and real-time database.

CO4: To work on design and development of protocols related to real-time communication.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S									S
CO2	S	M	S	M								S
CO3	S	M	S									S
CO4	S	S	S	M								S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

REAL TIME SPECIFICATION AND DESIGN TECHNIQUES 9

Introduction– Structure of a Real Time System –Task classes – Performance Measures for Real Time Systems – Estimating Program Run Times – Issues in Real Time Computing – Task Assignment and Scheduling – Classical uniprocessor scheduling algorithms –Fault Tolerant Scheduling.

UNIT II

REAL TIME SPECIFICATION AND DESIGN TECHNIQUES 9

Natural languages – mathematical specification – flow charts – structured charts – pseudocode and programming design languages – finite state automata – data flow diagrams – petrinets – WarnierOrr notation – state charts – polled loop systems – phase / sate driven code – co routines – interrupt – driven systems – foreground/background system – full featured real time operating systems.

UNIT III

INTERTASK COMMUNICATION AND SYNCHRONIZATION 9

Buffering data – mailboxes – critical regions – semaphores – deadlock – process stack management – dynamic allocation – static schemes – response time calculation – interrupt latency – time loading and its measurement – scheduling is NP complete – reducing response times and time loading – analysis of memory requirements – reducing memory loading – I/O performance.

UNIT IV

REAL TIME DATABASES **9**

Real time Databases – Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency control issues, Disk Scheduling Algorithms, Two – phase Approach to improve Predictability – Maintaining Serialization Consistency – Databases for Hard Real Time Systems.

UNIT V

EVALUATION TECHNIQUES **9**

Reliability Evaluation Techniques – Obtaining parameter values, Reliability models for Hardware Redundancy – Software error models. Clock Synchronization – Clock, A Nonfault – Tolerant Synchronization Algorithm – Impact of faults – Fault Tolerant Synchronization in Hardware – Fault Tolerant Synchronization in software.

TOTAL PERIODS:45

TEXT BOOKS:

1. Samarjit Chakraborty, JorgEberspacher," Advances in Real Time Systems,Springer,209
2. C.M. Krishna, Kang G. Shin, "Real Time Systems", McGraw Hill ", 2010.
3. Rajib Mall, "Real-time systems: theory and practice", Pearson Education, 2007.

REFERENCES:

1. Philip.A.Laplante, "Real Time System Design and Analysis", Prentice Hall of India, 3rd Edition,April 2004.
2. Allen Burns, Andy Wellings, "Real Time Systems and Programming Languages", PearsonEducation, 2003.

MC142GRAPH THEORY AND OPTIMIZATION TECHNIQUES

L	T	P	C
3	0	0	3

Course Objectives:

- To develop analytical capability and to impart knowledge in graphs, linear programming problem and statistical methods and their applications in Engineering & Technology
- To apply their concepts in engineering problems they would come across

Course Outcome:

After successful completion of this course, the students should be able to

CO1: To develop analytical capability and to impart knowledge in graphs, linear programming problem and statistical methods and their applications in Engineering & Technology

CO2: Students should be able to apply the concepts in solving the Engineering problems

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S							S	M
CO2	S	S	S	S							M	S

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

BASICS OF GRAPH THEORY

Graphs - Data structures for graphs – Sub graphs - Operations on Graphs Connectivity – Networks and the maximum flow - Minimum cut theorem - Trees - Spanning trees - Rooted trees – Matrix representation of graphs.

UNIT II **9**

CLASSES OF GRAPHS

Eulerian graphs and Hamiltonian graphs - Standard theorems - Planar graphs - Euler's formula - Five colour theorem - Coloring of graphs - Chromatic number (vertex and edge) properties and examples - Directed graphs.

UNIT III- **9**

GRAPH ALGORITHM

Computer Representation of graphs - Basic graph algorithms - Minimal spanning tree algorithm - Kruskal and Prim's algorithm - Shortest path algorithms - Dijsktra's algorithm - DFS and BFS algorithms.

UNIT IV **9**

OPTIMIZATION TECHNIQUES

Linear programming – Graphical methods – Simplex method (Artificial variables not included) – Transportation and assignment problems.

UNIT V **9**

STATISTICS

Tchebyshev’s inequality – Maximum likelihood estimation – Correlation – Partial correlation – Multiple correlations.

TOTAL PERIODS: 45

TEXT BOOKS:

1. NarsinghDeo, “Graph Theory with Applications to Engineering and Computer Science”, PHI,2004.

REFERENCES :

1. R. Balakrishnan, K. Ranganathan, “A Textbook of Graph Theory”,Springer,209.
2. AshayDharwadker,ShariefuddinPirzada,”Graph Theory”,2011
3. G.SureshSingh,”Graph Theory”,PHI,2010.

L	T	P	C
3	0	0	3

MCS143 FUZZY AND GENETIC ALGORITHM

Course Objectives:

- To introduce the ideas of Neural Networks, fuzzy logic and use of heuristics based on human experience.
- To introduce the concepts of Genetic algorithm and its applications to soft computing using some applications.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Learn the unified and exact mathematical basis as well as the general

CO2: Principles of various soft computing techniques.

CO3: Provide detailed theoretical and practical aspects of intelligent

CO4: Modeling, optimization and control of non-linear systems.

CO5: Prepare the students for developing intelligent systems through case

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S		S								
CO2	S	M	S	S								
CO3	M	S		S								
CO4	S	S		S								
CO5	S	S	M	S								

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT-I **9**

INTRODUCTION:

Uncertainty and Imprecision-Statistics and Random process - Uncertainty in information - Fuzzy sets and Membership - Chance versus ambiguity, classical Sets and Fuzzy Sets : Classical Sets - Fuzzy sets - Sets as points in hypercube, Classical Relations and Fuzzy Relations Cartesian product -Crisp Relations - Fuzzy Relations - Tolerance and Equivalence Relations - Value Assignments.

UNIT-I I **9**

Membership Functions: Features of Membership function - Standard forms and boundaries – Fuzzification - Membership value assignments. -Fuzzy to Crisp conversions: Lambda cuts for fuzzy sets - Lambda cuts for fuzzy relations- Defuzzification Methods.

UNIT-III **9**

Fuzzy Arithmetic, Numbers, Vectors and the Extension Principle: Extension Principle- Fuzzy numbers - Internal analysis in arithmetic - Approximate methods of extension. Classical logic and fuzzy logic: Classical predicate logic - Fuzzy logic - Approximate reasoning - Fuzzy Tautologies - Other forms of the implication & composition operation.

UNIT-IV **9**

Fuzzy Rule Based Systems: Natural language - Linguistic hedges - Rule based systems - Graphical techniques of inference, Fuzzy Nonlinear Simulation: Fuzzy Relational Equations - Partitioning - Nonlinear Simulation using fuzzy rule based systems - FAMs. Fuzzy decision making.

UNIT-V **9**

Fuzzy Classification: Classification by equivalence relations- Cluster analysis - Cluster validity - Classification metric - Hardening the fuzzy - Partition, Fuzzy Pattern Recognition : Feature analysis-Partitions of the feature space - Single sample identification - Image processing syntactic recognition.

TOTAL PERIODS: 45

TEXT BOOKS

1. S. Rajasekaran and G.A.V.Pai, ,"Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2011.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill International Edition 2009.

REFERENCE

1. J. Harris,"An Introduction to Fuzzy Logic Applications",Springer,2001

L	T	P	C
3	0	0	3

MCS144 MIDDLEWARE TECHNOLOGIES

Course Objectives:

- The course provides details about the modern component platforms.
- Based on practical examples, details about modern middleware technologies will be analyzed.
- Students get the chance to gain in-depth knowledge about their favorite middleware platform.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Thoroughly, individually, describe the most important aspects when using middleware technologies

CO2: Be able to, in group;develop a component-based application based on middleware technology.

CO3: Be able to individually judge existing or new middleware frameworks in comparison to historical and today's solutions

CO4: Individually, in detail describe differences and similarities in different middleware platforms.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M										
CO2	S	M		M								
CO3	S	M										
CO4		S	M	M								

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

CLIENT / SERVER CONCEPTS

Client – Server – File Server, Database server, Group server, Object server, Web server .Middleware – General Middleware – Service specific middleware. Client / ServerBuilding blocks – RPC – Messaging – Peer – to- Peer.

UNIT II **9**

EJB ARCHITECTURE

EJB – EJB Architecture – Overview of EJB software architecture – View of EJB – Conversation – Building and Deploying EJBs – Roles in EJB.

UNIT III **9**

EJB APPLICATIONS

EJB Session Beans – EJB entity beans – EJB clients – EJB Deployment – Building an application with EJB.

UNIT IV **9**

CORBA

CORBA – Distributed Systems – Purpose - Exploring CORBA alternatives – Architecture overview – CORBA and networking model – CORBA object model – IDL – ORB - Building an application with CORBA.

UNIT V **9**

COMPONENT OBJECT MODEL

COM – Data types – Interfaces – Proxy and Stub – Marshalling – Implementing Server / Client – Interface Pointers – Object Creation, Invocation , Destruction – Comparison COM and CORBA – Introduction to .NET – Overview of .NET architecture – Marshalling - Remoting.

TOTAL PERIODS:45

TEXT BOOKS:

1. Robert Orfali, Dan Harkey and Jeri Edwards, "The Essential Client/Server Survival Guide", Galgotia Publications Pvt. Ltd., 2002.
2. Tom Valesky,"Enterprise Java Beans", Pearson Education, 2002.

REFERENCES:

1. Jesse Liberty, "Programming C#", 2nd Edition, O'Reilly Press, 2002.
2. Mowbray,"Inside CORBA", Pearson Education, 2002.
3. Jason Pritchard,"COM and CORBA side by side", Addison Wesley, 2000.

MCS145HUMAN COMPUTER INTERACTION

L	T	P	C
3	0	0	3

Course Objectives:

- Determine the need for computers and evaluate the use of computers,
- identify the stages in software engineering that need to be modified for effectiveness of interacting with computers
- discover the various models that can be used for designing systems
- evaluate the design techniques by applying the apt statistical approach
- Design dialogue for representation to computers

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the human components functions regarding interaction with computer
CO2: Explain Computer components functions regarding interaction with human
CO3: Demonstrate Understanding of Interaction between the human and computer components.
CO4: Use Paradigms
CO5: Implement Interaction design basics
CO6: Use HCI in the software process
CO7: Apply Design rules
CO8: Produce Implementation supports
CO9: Use Evaluation techniques

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S		S								
CO2	S	S		S								
CO3	S	S		S						S		
CO4	S	S		S								
CO5	S	S		S								
CO6	S	S		S	M							
CO7	S	S		S								
CO8	S	S		S								
CO9	S	S		S	M							

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I

DESIGN PROCESS **9**

Humans – Information process – Computer – Information Process – Differences and Similarities between them – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms – Designing of Interactive systems – Usability – Paradigm shift – Interaction design basics – Design Process – Scenarios – Users need – Complexity of design

UNIT II **9**

DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS

Software Process – Usability engineering – Issue based Information systems – Iterative design practices – Design rules – maximum usability – Principles – Standards and guidelines – design patterns – Programming Tools – Windowing systems – Interaction tool kit – User 97 Interface management system – Evaluation techniques – evaluation design – Evaluating implementations – Observational Methods .

UNIT III

MODELS **9**

Universal design principles – Multimodal systems – User Support – Presentation and Implementation Issues – types – requirements – approaches – Cognitive model – Hierarchical model – Linguistic model – physical and device models – Socio-technical models – Communication and Collaboration models – Task models – Task analysis and design.

UNIT IV **9**

EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI

Basic Design structure – Single independent variable – multiple independent variable – factorial design – split-plot design – random errors – experimental procedure – Statistical analysis.

T tests – Analysis of Variance test – Regression – Chi-Square test – Survey – Probabilistic sampling – Non-probabilistic sampling – developing survey questions

UNIT V **9**

THEORIES Dialogue notations and design – Dialogue need – dialogue design notations – Graphical – Textual - representing dialogue – formal descriptions – Dialogue analysis – System models – Interaction models – relationship with dialogue – Formalisms – Formal notations – Interstitial behavior – Virtual reality – Modeling rich interaction – Status Event analysis – Properties – Rich contexts – Sensor-based systems – Groupware – Applications – Ubiquitous computing – Virtual reality

TOTAL PERIODS: 45

TEXT BOOKS:

1. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, “Research Methods in HumanComputer Interaction”, Wiley, 2010.
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale “Human Computer Interaction”, 3rd Edition Prentice Hall, 2004.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant “Designing the User Interface: Strategies for Effective Human-Computer Interaction “,Addison-Wesley ,5th Edition,2009.

MCS146 COMPONENT BASED SYSTEM DESIGN

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the concept of distributed component architectures, including its relationship to the object-oriented programming paradigm.

- To demonstrate the importance of reusability and focuses on designpattern and frameworks in distribute component architecture.
- To introduce different component frameworks, including EnterpriseJava Beans, COM, CORBA, Web Services and discuss interoperability.
- Between applications built in different frameworks using .NET.
- To present primary issues in component frameworks, including events
- properties, introspection and reflection, persistence, and packaging will be thoroughly reviewed.
- To describe software architecture and its evaluation mechanism forsupporting components and theoretical foundations of components

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the human components functions regarding interaction with computer

CO2: Explain Computer components functions regarding interaction with human

CO3: Demonstrate Understanding of Interaction between the human and computer components.

CO4: Use Paradigms

CO5: Implement Interaction design basics

CO6: Use HCI in the software process

CO7: Apply Design rules

CO8: Produce Implementation supports

CO9: Use Evaluation techniques

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1			S				M	M	S	M	M	S
CO2			S					S	S	M		
CO3			S				M	M	S		M	
CO4			S					M	S	M		M
CO5			S				M	M	S			M
CO6		S	S			M			S			
CO7			S	M			S		S			
CO8			S						M			S
CO9					M						M	

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar	1.Course & Survey 2. Faculty Survey 3.Industry

4.Online Test 5.Quiz 6.End Semester Exam	4.Alumni

UNIT I **9**

BASIC CONCEPTS

Software Components - Component models and Component Services-myths in Component Based Technology - Risk Factors - Success Factors, Component Based Software Development.

UNIT II **9**

COMPONENTS, ARCHITECTURE AND PROCESS

Component Architecture, Component Frameworks, Component Development, Component distribution and acquisition, Component assembly, markets and components.

UNIT III **9**

DESIGN OF SOFTWARE COMPONENT

Software Components and the UML Component Infrastructures - Business Components - Components and Connectors - Designing Models of Modularity & Integration

UNIT IV **9**

MANAGEMENT OF COMPONENT BASED SOFTWARE SYSTEMS

Measurement and Metrics for Software Components - Selecting the right Components - Software Component Project Management - Trouble with Testing Components - Configuration Management and Component Libraries - Evolution Maintenance of Management of Component based Systems.

UNIT V **9**

COMPONENT TECHNOLOGIES

Overview of the Following Component Models: CORBA, COM+, Enterprise Java Beans, Software Agents.

TOTAL PERIODS:45

TEXT BOOKS:

1. 1.ClemensSzyperski, "Component Software - Beyond object oriented programming", Pearson Education, 2nd edition, 2004.
2. 2.GeorgeT.Heinemen, William T. Councill, "Component Based Software Engineering",2001.

REFERENCES:

1. Thomas J..Mowbray, William A.Ruh, "Inside CORBA Distributed Object Standards and Applications", Addison - Wesley, 2001.
2. Dale Rojerson, "Inside COM", Microsoft Press, 2001.
3. Andreas Vogel, Keith Duddy "Java Programming with CORBA" John Wiley & Sons,3rd edition,2001.

MCS147 **DISTRIBUTED OPERATING SYSTEM**

L	T	P	C
3	0	0	3

Course Objectives:

- To provide hardware and software issues in modern distributed systems.
- To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To provide hardware and software issues in modern distributed systems.

CO2: To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.

CO3: To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S		S									S
CO2		S	S	M								S
CO3	S	M	S									S

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

Modes of communication, System Process, Interrupt Handling, Handling Systems calls, Protection of resources&Resources Management Micro-Kernel Operating System.

UNIT II **9**

Review of Network Operating System and Distributed Operating System, Issue in the design of DistributedOperating System, Overview of Computer Networks. Inter process communication, Linux, IPC Mechanism, Remote Procedure calls, RPC exception handling, security issues, RPC in Heterogeneous Environment (case study Linux RPC)

UNIT III **9**

Clock Synchronization, Logical clocks, Physical clocks, clock synchronization algorithms, Mutual Exclusion, Election Algorithms,Dead locks in Distributed Systems. Thrashing, Heterogeneous DSM, Resource Management (Load Balancingapproach, Load Sharing approach), Process Management: process Migration, Thread.

UNIT IV **9**

Overview of shared memory, consistency model, Page based Distributed Shared Memory, Shared –variableDistributed Memory, Object -based Distributed Memory.

UNIT -V **9**

File models, File access, File sharing, file-caching, File Replication, fault Tolerance, Network File System, (Casestudy, 8NFS on Linux Directory Services, Security in Distributed File system).

TOTAL PERIODS:45

TEXT BOOKS:

1. M. Beck et al," Linux Kernal Programming",3rd edition, 2002.
2. B.W. Kernighan and R Pide, "The Unix Programming Environment ",Prentice Hall of India-2000.

REFERENCE:

1. Silberschatz,P.B.Garvin,Gagne," Operating System Concepts", 2009.

MCS148 EMBEDDED SYSTEM

L	T	P	C
3	0	0	3

Course Objectives:

- To study the software designing used in embedded systems.
- To study the object oriented analysis and design for real time systems.
- To study the development activities of real time system using UML.

Course Outcomes:

CO1: Apply Object Structure and Behavior analysis in real time design
CO2: Apply the concept of architectural design in practical applications
CO3: Apply objects and classes concepts in real time applications

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S							S				
CO2	S	M		M				S				
CO3	S	M						S				M

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

6.End Semester Exam	

UNIT -I **9**

REVIEW OF EMBEDDED HARD WARE

Gates - Timing Diagram - Memory - Microprocessor - Buses - Direct Memory Access - Interrupts - Built ins on the Microprocessor - Convention Used on Schematic - Schematic - Interrupts Microprocessor Architecture - Interrupt Basics - Shared Data Problem - Interrupt Latency.

UNIT- II **9**

MICROCHIP PIC MICRO CONTROLLER

Introduction - CPU Architecture - Registers - Instruction Sets - Addressing Modes - Loop Timing - Timers - Interrupts Timing - I/O Exception - I2 C Bus Operation - Serial EEPROM - Analog to Digital Converter - UART - Baud Rate - Data Handling - Initialization - Special features - Serial Programming - Parallel Slave Port.

UNIT- III **9**

EMBEDDED MICROCOMPUTER SYSTEM

Motorola MC68H11 Family Architecture - Registers - Addressing Modes Programs - Interfacing Methods - Parallel I/O Interface - Parallel Port Interface - Memory Interfacing - High Speed I/O Interfacing - Interrupts- Interrupt Service Routine - Features of Interrupts - Interrupt Vector - Priority - Timing Generation & Measurement - Input capture - Output Compare - Frequency measurement - Serial I/O Devices - RS 232, RS485 - Analog Interfacing - Applications.

UNIT -IV **9**

SOFTWARE DEVELOPMENT

Round Robin - Round Robin with Interrupts - Function - Queue Scheduling Architecture & Algorithms - Introduction to - Assemblers, Compliers, Cross Compliers, Integrated Development environment(IDE) - Object Oriented Interfacing - Recursion - Debugging Strategies - Simulators .

UNIT -V **9**

REAL TIME OPERATING SYSTEM

Task & Task States - Tasks & Data - Semaphores & Shared Data - Operating System Services - Message Queues - Timer Functions - Event Memory Management - Interrupt Routines & RTOS Environment - Basic design Using RTOS.

TOTAL PERIODS:45

TEXT BOOKS:

1. David E. Simon, "An Embedded Software Primer", Pearson Education, 2004
2. Jonartthan W. Valvano, "Embedded Micro Computer System:Real Time Interfacing", Thomson Learning, 2001.

REFERENCES:

1. Laplante,Ovaska,"Real-Time Systems Design and Analysis: Tools for the Practitioner", 4th Edition,Wiley,2013.

2. Bruce Schneier, Niels Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt. Ltd., 2003.

L	T	P	C
3	0	0	3

MCS149 SPEECH TECHNOLOGY

Course Objectives:

- To provide knowledge in fundamentals of speech processing
- To get knowledge in speech models.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: The student will gain enough understanding of speech models

CO2: The student will understand and estimate the impact of different digital speech recognition models

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M										
CO2		M	S							S		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

FUNDAMENTALS OF SPEECH PROCESSING

Introduction to Speech processing - applications - Fundamentals of speech processing - Analysis tools - z - Fourier - DFT transforms - FIR - IIR filters - sampling.

UNIT II **9**

SPEECH MODELS

Digital models - Vocal tract analog and digital models - Time Domain models - Useful Performance measures - zero - crossings - voiced - unvoiced - pitch periods - correlation Functions - smoothing.

UNIT III **9**

DIGITAL REPRESENTATION AND ANALYSIS

Digital representations of speech waveform - Encoding of speech using delta modulation - PCM - differential PCM - other systems - Short-time Fourier analysis - Short term analysis Effects - filter banks - pitch detection - vocoders.

UNIT IV **9**

HOMOMORPHIC SPEECH PROCESSING AND LINEAR PREDICTIVE CODING

Homomorphic speech processing - Cepstrum - pitch detection - formant estimation - vocoders - Linear predictive coding of speech - LPC methods and parameters - relations between speech parameters.

UNIT V **9**

DIGITAL SPEECH PROCESSING AND RECOGNITION

Digital speech processing for man - machine communication by voice - Speech and speaker recognition - voice response systems.

TOTAL PERIODS: 45

TEXT BOOKS:

1. L. R. Rabiner& R. W. Schafer, "Digital Processing of Speech Signals", Prentice Hall, 2008.
2. Amy Neustein,"Advances in Speech Recognition"Springer,2010.
3. Claudio,Klucio,"Speech Recognition",Wiley 2008

REFERENCES:

1. Wai C. Chu,,"Speech Coding Algorithms: Foundation and Evolution of Standardized Coders",John Wiley & Sons,2003.
2. Javier Ramírez, Juan Manuel Górriz," Recent Advances in Robust Speech Recognition Technology", ,2011.

MCS150 INFORMATION TECHNOLOGY AND CYBER LAWS

Course Objectives:

- To provide with a thorough understanding of the issues associated with the design, provision and management of security services for information systems.
- To learn the different aspects of information security, security attacks and the defense strategies used to combat them.

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Describe the fundamental concepts of information system security cyber laws

CO2: Understand the basic security terms such as encryption, authentication, firewall.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	M	S		M			M	S		
CO2	S	S		M					M	S		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I **9**

Crimes of this millennium – checks and balances against arbitrary arrests –concept of cyber crime and the IT Act- Hacking – Teenage Web Vandals – Cyber Fraud and Cyber Cheating – Virus on the Internet-other IT Act offences – Network service providers-Criminal justice in India and Implications.

UNIT -II **9**

Contracts in the InfoTech World – Click Wrap and Shrink Wrap contracts – contract formation under the Indian context – contract formation on the Internet – Terms and conditions of the Contract – jurisdiction and information technology act – foreign judgements in India – IPR disputes – misuse of the law of jurisdiction – jurisdictional disputes with respect to the internet in USA.

UNIT- III **9**

Concept of Domain Name and Reply to Cyber squatters – meta-tagging – copyright ownership and assignment – License of copyright – copyright term and respect for foreign works – copyright infringement remedies and offences – copyright protection of content on the Internet – computer software piracy

UNIT- IV **9**

Concept of permanent Establishment – PE in cross border E-Commerce - the United Nations model Tax treaty – law of double taxation avoidance agreements – Tax Agents of non-residents under the Income tax act and the relevance to E commerce – impact of the internet on customs duties – taxation policies in India

UNIT -V **9**

Digital signatures – Digital signature certificate – certifying authorities and liability in the event of Digital signature compromise – status of Electronic records as Evidence – proving Digital signatures – proof of Electronic agreements – proving electronic messages – goods

and services – consumer complaint – defect in goods and deficiency in services restrictive and unfair trade –practices – reliefs under CPA – consumer for as, jurisdictions and implications on cyber consumers in.

TOTAL PERIODS: 45

TEXT BOOKS:

1. R. K. Chaubey, "An Introduction to cyber crime and cyber law", Kamal Law House, second edition 209.
2. VivekSood, "Cyber law Simplified", Tata McGraw Hill, 2001.

REFERENCES:

1. John W. Rittinghouse, William M. Hancock, "Cybersecurity Operations Handbook", 2005.
2. John R. Vacca, "Computer forensics: Computer Crime Scene Investigation", 2nd Edition, Charles River Media, Inc. Boston, 2005.

MCS151 PHP PROGRAMMING

L	T	P	C
3	0	0	3

Course Objectives:

- It gives all students exposure to basics of PHP
- It gives knowledge on session tracking and graphics using PHP

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Recognize the difference between HTML, XHTML, MySQL& PHP.

CO2: Differentiate between PHP Web & HTML Controls

CO3: Understand different Web controls

CO4: Understand connecting Web pages with DB.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	S	S	S			S	M		S	
CO2	M	S	S	M	S			S	M		S	
CO3	M	S	S	M	M			S	M		S	
CO4	S	S	S	M	S			S	M		S	

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT I **9**

L	T	P	C

PHP Introduction: PHP Basics - Evolution of PHP - Introduction to PHP Programming Variables, Operators, and Constants: Introduction to Variables – Operators – Type Juggling - Type Casting - Variable Variables - function for Determining and Setting Variable- Types - Constants. Control Structures: Conditional Expressions- Arrays: Introduction to Arrays- Initializing Arrays - Working with Arrays. Functions: Introduction to Functions - Passing Arguments to Functions - Returning Values from Functions - Understanding the Scope of a Variable within a Function, Variable Functions and Variable Argument Functions.

UNIT II **9**

Understanding Classes: Classes – Constructors - Extending a class.Form Parsing in PHP: Parsing HTML Posted Values in PHP - Form Validation- Printing the Confirmation Page - Printing Hidden Fields - Putting Theory into Practice. Handling Files: Working with Files - Putting Theory into Practice.

UNIT III **9**

Handling Data Storage: An Introduction to Database Concepts - Database Management System - Relational Database Management System - Database Normalization - PHP Support to various Databases - Web Database Architecture -MySQL Database Programming.Using PHP with SQL Databases: Working with MySQL - Using Multiple Databases Simultaneously - Important PHP-MySQL Functions - Error handling in MySQL – Error Types in PHP - Creating Customized Error Handlers.

UNIT IV **9**

Session Tracking: An Overview of Sessions - Tracking Sessions. Input Validators in PHP: Validation Basics - Performing Validations in an HTML Web Page - Performing Validations in PHP - Functions for Validating User Input - Validating Email Addresses. Cookies: What Is a Cookie? Implementing Cookies in PHP - Are Cookies Harmful?

UNIT V **9**

Graphics in PHP: Graphics on the web - Creating Images in PHP. Understanding CVS: CVS an Overview – The CVS Repository – Environment Variables in CVS - CVS Command Options.PEAR: Introduction to PEAR – Coding Standards in PEAR – PEAR and CVS – Contributing Codes to PEAR – Requirements to Make Changes in PEAR – Help in PEAR.

TOTAL PERIODS: 45

TEXT BOOKS:

1. *Matt Doyle," Beginning PHP 5.3",Wiley,2011.*
2. Ashish Wilfred,Meeta Gupta and Kartik Bhatnagar with NIIT, "PHP Professional Projects**",** Prentice Hall of India, 2002.

REFERENCES:

1. Kevin Tatroe, Peter MacIntyre, RasmusLerdorf ,"Programming PHP",O'Rielley,2013.
2. RasmusLerdorf and Kevin Tatroe, "Programming in PHP", O'Reilly and Associates, 2002

MCS152 QUANTUM THEORY & ALGORITHM DESIGN

3	0	0	3

Course Objectives:

- It gives all students exposure to important concepts in quantum theory
- It gives knowledge in matrices, tensor products
- It gives knowledge in dynamic programming and various algorithms using data structure

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand Quantum Computing

CO2: Understand the Quantum theory algorithms

CO3: Understand how to apply algorithms using various data structure for real time Applications.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	M	S						M		
CO2	S	S	M	S						M		
CO3	S	S	M	S						M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT- I **9**

Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination Of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidtorthogonalization, bracket formalism, the Cauchy-schwarez and triangle Inequalities.

UNIT -II **9**

Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products & matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values & Eigen Vectors, Spectral Decompostion, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators, Commutator Algebra, Heisenberg uncertainty principle, polar decomposition & singular values, Postulates of Quantum Mechanics.

UNIT -III **9**

Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices.

UNIT- IV **9**

Density Operator: Density Operator of Pure & Mix state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce Density Operator, Density Operator & Bloch Vector.
Quantum Measurement Theory : Distinguishing Quantum states & Measures, Projective Measurements, Measurement on Composite systems, Generalized Measurements, Positive Operator- Valued Measures.

UNIT -V **9**

Introduction Mathematics for Algorithmic: Sets, Functions and Relations. Amortized Analysis: Properties of Matrices, Solving systems of linear Equations, Linear programming, general linear programs, an overview of linear programming The Greedy Methods: Optimization problems, the greedy method, 0/1 knapsack problem, topological sorting, Single source shortest path, minimum cost spanning tree. Divide & Conquer: The method. Application: merge sort. Dynamic programming: The method, Application: 0/1 knapsack problem Skip lists and hashing. Priority Queues: Huffman Codes. Binary Search Trees: Binary search trees, indexed binary search trees, binary search tree operations and implementation. Graphs. Basic Data Structures: Tree, The tree Abstract Data type, Tree Traversal, Binary tree.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Zdzis_lawMeglicki," Quantum Computing without Magic",The MIT Press,2008.
2. David McMahon,"Quantum Computing Explained",Wiely,2008.
3. Marco Lanzagorta, Jeffrey Uhlmann," Quantum Computer Science",2009.

REFERENCES:

1. Michael T. Goodrich ,"Algorithm Design and Applications",Wiley,2014.
2. Thomas H. Cormen, Leiserson, Rivest&Stein ,"Introduction to Algorithms",2009.
3. Phillip Kaye, Raymond Laflamme, Michele Mosca, "An Introduction to Quantum Computing",Oxford,2007.

MCS153 INFORMATION SECURITY

L	T	P	C
3	0	0	3

Course Objectives:

- To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security.
- To provide concept-level hands-on experience in specific topic area.
- To provide the ability to examine and analyze real-life security cases.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Harden servers and clients.

CO2: Recognize common attack patterns.

CO3: Evaluate vulnerability of an information system and establish a plan for risk management

CO4: Demonstrate how to detect and reduce threats in Web security.

CO5: Evaluate the authentication and encryption needs of an information system.
CO6: Explain the Public Key Infrastructure process
CO7: Demonstrate how to secure a wireless network
CO8: Evaluate a company's security policies and procedures

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	M	M				S				M		
CO2	M	S			S	S				M		
CO3	M	S			M	S				M		
CO4	M	M				S				M		
CO5	M	S			S	S				M		
CO6	M	S				S				M		
CO7	M	S			M	S				M		
CO8	M	S				S				M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT – I **9**

Cryptography and Data Security Information assurance issues -Threats to authentication, privacy and integrity, Generating MD5 hash collisions -Approaches to cryptography - Symmetric vs. asymmetric ciphers, Issues for secret key encryption

UNIT – II **9**

Public key fixes to secret key problems, Hashing and digital signatures, Generating and exchanging keys -Authentication via key ownership, Non-repudiation using digital signatures, Digital signatures in the real world, Key distribution and management, E-voting.

UNIT – III **9**

Intrusion Detection Overview, Host based intrusion detection systems, Network based intrusion detection systems, IDS as part of the overall Security System

UNIT – IV **9**

IDS Signatures and Analysis Schemes for Intrusion Detection Systems, Anomaly detection, Expert Systems, Tools for packet analysis and intrusion detection, Some intrusion detection tools(Snort,Windump,Ethereal etc.).

UNIT V **9**

Case Reports of various attack strategies, Implementation Issues, Future directions

TOTAL PERIODS: 45

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Prentice Hall of India, Third Edition, 2003.
2. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.

REFERENCES:

1. William Stallings; Network Secuirty Essentials, Pearson publication, 2005.
2. William Stallings; Cryptography and Network Security, Pearson publication, 4th edition, 2004.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003.
4. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.

MCS154 INTERNET TECHNOLOGY

L	T	P	C
3	0	0	3

Course Objectives:

- Be able to use the basic features of web browsers, such as Internet Explorer and Firefox;
- Be able to use such Internet tools as email, ftp, and search engines;
- Understand the implications of Internet on society, primarily in the aspects of communication, commerce, crime, ethics, and privacy;
- Understand the generic principles of computer programming as applied to implementing basic web-based applications;
- Use the knowledge both of algorithmic functions and of computer programming in web-based application settings;

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply client web technologies.

CO2: Design and implement website using XHTML and CSS.

CO3: Apply JavaScript to provide better website user experience.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	M	S	S	M					M		
CO2	S	S	S	S	S					M		
CO3	M	S	S	S	S					M		

Course Assessment methods:

Direct	Indirect

1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT – I **9**

Introduction: Introduction to Internet, History of Internet, Internet Standards, Practical uses of Internet. Component of the Internet: Connection requirements and options, Internet addressing, Internet standards, Web browser basics.

UNIT – II **9**

Building Blocks: Understanding protocols, Transmission Control Protocol/Internet Protocol, Name resolution protocols, Client-side protocols, Internet client infrastructure.

UNIT –III **9**

Components of web page: HTML, DHTML, CSS, JavaScript, XML; Website Design, Overview of Web Servers , Core Components: Hardware platforms, Internet server components, Web servers, E-mail servers, FTP servers, Proxy servers, News servers, Directory servers, Mirrored servers.

UNIT – IV **9**

Networking Hardware and Software Components: Network Interface Cards, Network Cables, Network Connecting Devices etc.

UNIT – V **9**

How Web Applications Work, Web Objects, Building a Simple internet Program- case study.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Douglas E Comer ,"Computer Networks and Internets With Internet Applications", Pearson ,2008.
2. B.Forouzan ,"Data Communication and Networking ",McGraw Hill,2007.
3. William Stallings ,"Computer Network with Internet Protocols",Pearson ,2003.

REFERENCES:

1. Deitel And Deitel ,"Internet & World wide Web :How to Program",Pearson,209.
2. Danny Goodman ,"Dynamic HTML: The Definitive Reference (2nd Edition)",O'reilly, 2008.
3. Bryan Pfaffenberger, Bill Karrow," HTML 4 Bible", Wiley,2000.
4. Stuart Conway," HTML 4.01 Programmer's Reference", Wrox Press 2001.

MCS155 BIO-INSPIRED ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

Course Objectives:

- To appreciate the use of biological aspects in building intelligent systems
- To understand the algorithms, programming and applications of Evolutionary and geneticalgorithms and neural and fuzzy systems
- To appreciate the adaptation of cellular and developmental systems
- To focus on the understanding of artificial immune systems and its applications
- To understand issues in developing collective and behavioural systems.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Use existing open source tools to build an application using genetic approaches

CO2: Identify different applications suitable for different types of neural networks giving justifications

CO3: Criticallyanalyze the use of cellular systems

CO4: Differentiate the different models of immune systems

CO5: Do a literature survey on applications of artificial immune systems

CO6: Implement the Particle swarm and Ant colony algorithms within a framework and build applications

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO9
CO1	S	S	M	S						M		
CO2	S	S		S						M		
CO3	S	S	M	S						M		
CO4	S	S	M	S						M		
CO5	S	S	M	S						M		
CO6	S	S		S						M		

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignments 3. Seminar 4.Online Test 5.Quiz 6.End Semester Exam	1.Course & Survey 2. Faculty Survey 3.Industry 4.Alumni

UNIT -I **9**

EVOLUTIONARY SYSTEMS

Evolutionary Systems – Artificial Evolution - Genetic Representations - Evolutionary Measures - Types of Evolutionary Algorithms - Schema Theory.Evolutionary Computation-Representation- Selection- Reproduction.Genetic Algorithms - Canonical Genetic Algorithm – Crossover- Mutation - Control Parameters – Applications.Genetic Programming - Tree-Based Representation – Building Block Genetic Programming –Applications. Evolutionary Programming – Basics –Operators –Strategy Parameters -Evolutionary Programming Implementations

UNIT- II **9**

NEURAL AND FUZZY SYSTEMS

Neural Networks - Biological Nervous Systems - Artificial Neural Learning - Architecture. Unsupervised Learning - Self-Organizing Feature Maps.Supervised Learning – Types-Learning Rules.Radial Basis Function Networks.Reinforcement Learning – Model Free - Neural Networks and Reinforcement Learning. Fuzzy Systems- Fuzzy Sets – Logic and Reasoning – Controllers- Rough Sets.

UNIT -III **9**

CELLULAR AND DEVELOPMENT SYSTEMS

Cellular Systems - The Basic Ingredients - Cellular Automata -Modelling - Classic Cellular Automata – Other Cellular Systems – Computation - Artificial Life - Complex Systems - Analysis and Synthesis of Cellular Systems. Developmental Systems - Potential Advantages of a Developmental Representation -Rewriting Systems - Synthesis of Developmental Systems - Evolution and Development – DefiningEvolutionary Developmental Systems - Evolutionary Rewriting Systems –DevelopmentalPrograms and Processes.

UNIT- IV **9**

IMMUNE SYSTEMS AND COLLECTIVE SYSTEMS

Natural Immune systems - Classical View -Working -Constituents of Biological Immune Systems - Immunity Types - Learning the Antigen Structure - The Network Theory - The Danger Theory –Artificial Immune Systems - Algorithms - Classical View Models - Clonal Selection Theory Models – Network Theory Models - Danger Theory Models - Applications and Other AIS models Applications- Biological Self-Organization - Particle Swarm Optimization - Basics - Social Network Structures – Variations - Basic PSO Parameters - Optimization - Applications. Ant Colony Optimization – Cemetery Organization and Brood Care - Division of Labor –Application.

UNITV **9**

BEHAVIORAL SYSTEMS

Behavioral Systems - Behavior in Cognitive Science - Behavior in Artificial Intelligence – BehavioralSystems – Behavior Based Robots –Evolution - Co-evolution - Learning and Self Reproduction of Behavioral Systems. Cultural Algorithms - Culture and Artificial Culture - Cultural Algorithm – BeliefSpace – Fuzzy Cultural Algorithms – Applications.Co-evolution – Types - Competitive andCooperative Co-evolution.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Claudio Mattiussi, Dario Floreano "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies" (Intelligent Robotics and Autonomous Agents series), MIT Press, 2008.

REFERENCES:

1. Andries P. Engelbrecht, "Computational Intelligence: An Introduction", 2nd Edition , Wiley; 2007.
2. Russell C. Eberhart, Yuhui Shi "Computational Intelligence: Concepts to Implementations", Morgan Kaufmann; first edition 2007.