UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY, CHENNAI 600 025
REGULATIONS - 2013
M.TECH - INFORMATION TECHNOLOGY
CURRICULUM AND SYLLABUS I TO IV SEMESTERS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8101	Advanced Databases	3	0	0	3
2.	IF8102	Network Engineering	3	0	0	3
3.	IF8151	Advanced Computer Architecture	3	0	0	3
4.	IF8152	Advanced Data Structures and Algorithm Analysis	3	0	0	3
5.	MA8160	Probability and Statistical Methods	3	1	0	4
6.	MM8163	Software Engineering Methodologies	3	0	0	3
PRACTICAL						
7	IF8111	Data Structures Laboratory	0	0	3	2
8	IF8112	Networking and DBMS Laboratory	0	0	3	2
		TOTAL	**18**	**1**	**6**	**23**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8201	Data Analytics	3	0	0	3
2.	IF8202	Web Integrated Technologies	3	0	0	3
3.	IF8251	Advanced Operating System	3	0	0	3
4.	IF8252	Cloud Computing Technologies	3	0	0	3
5.	IF8254	Mobile and Pervasive Computing	3	0	0	3
6.		Elective I	3	0	0	3
PRACTICAL						
7.	IF8211	OS and Mobile Laboratory	0	0	3	2
8.	IF8212	Web Integrated Technologies Laboratory	0	0	3	2
		TOTAL	**18**	**0**	**6**	**22**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	IF8301	Cryptography and Information Security	3	0	0	3
2		Elective II	3	0	0	3
3		Elective III	3	0	0	3
PRACTICAL						
4	IF8311	Project Work Phase I	0	0	12	6
5	IF8312	Technical Seminar and Report writing	0	0	2	1
		TOTAL	**9**	**0**	**14**	**16**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	IF8411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL NO OF CREDITS: 73

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY, CHENNAI 600 025

REGULATIONS - 2013

M.TECH - INFORMATION TECHNOLOGY (PART TIME)

CURRICULUM AND SYLLABUS I TO VI SEMESTERS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8151	Advanced Computer Architecture	3	0	0	3
2.	IF8152	Advanced Data Structures and Algorithm Analysis	3	0	0	3
3.	MA8160	Probability and Statistical Methods	3	1	0	4
PRACTICAL						
4.	IF8111	Data Structures Laboratory	0	0	3	2
		TOTAL	**9**	**1**	**3**	**12**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8202	Web Integrated Technologies	3	0	0	3
2.	IF8251	Advanced Operating System	3	0	0	3
3.	IF8254	Mobile and Pervasive Computing	3	0	0	3
PRACTICAL						
4.	IF8211	OS and Mobile Laboratory	0	0	3	2
5.	IF8212	Web Integrated Technologies Laboratory	0	0	3	2
		TOTAL	**9**	**0**	**6**	**13**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8101	Advanced Databases	3	0	0	3
2.	IF8102	Network Engineering	3	0	0	3
3.	MM8163	Software Engineering Methodologies	3	0	0	3
PRACTICAL						
4.	IF8112	Networking and DBMS Laboratory	0	0	3	2
		TOTAL	**9**	**0**	**3**	**11**

Attested

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SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IF8201	Data Analytics	3	0	0	3
2.	IF8252	Cloud Computing Technologies	3	0	0	3
3.		Elective I	3	0	0	3
		TOTAL	**9**	**0**	**0**	**9**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	IF8301	Cryptography and Information Security	3	0	0	3
2		Elective II	3	0	0	3
PRACTICAL						
3.	IF8311	Project Work Phase I	0	0	12	6
4.	IF8312	Technical Seminar and Report writing	0	0	2	1
		TOTAL	**6**	**0**	**14**	**13**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.		Elective III	3	0	0	3
PRACTICAL						
2	IF8411	Project Work Phase II	0	0	24	12
		TOTAL	**3**	**0**	**24**	**15**

TOTAL NO OF CREDITS: 73

LIST OF ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	IF8001	3G and 4G Wireless Networks	3	0	0	3
2.	IF8002	Building Internet of Things	3	0	0	3
3.	IF8003	Computer Graphics and Multimedia	3	0	0	3
4.	IF8004	Cyber Forensics	3	0	0	3
5.	IF8005	Design of Software Agents	3	0	0	3
6.	IF8006	E-Learning	3	0	0	3
7.	IF8007	Green Computing	3	0	0	3
8.	IF8008	Grid Computing	3	0	0	3
9.	IF8009	Knowledge Engineering	3	0	0	3
10.	IF8010	Semantic Web	3	0	0	3
11.	IF8011	Text Mining	3	0	0	3
12.	IF8012	X-Informatics	3	0	0	3
13.	IF8013	Machine Learning	3	0	0	3
14.	CP8075	Social Network Analysis	3	0	0	3
15.	IF8071	Artificial Intelligence	3	0	0	3
16.	IF8072	Compiler Design	3	0	0	3
17.	IF8073	Computer Vision	3	0	0	3
18.	IF8074	Data Warehousing and Data Mining	3	0	0	3
19.	IF8075	Digital Signal Processing	3	0	0	3
20.	IF8076	Embedded Computing System Design	3	0	0	3
21.	IF8077	Human Computer Interaction	3	0	0	3
22.	IF8078	Image Processing	3	0	0	3
23.	IF8079	Information Retrieval	3	0	0	3
24.	IF8080	Service Oriented Architecture	3	0	0	3
25.	IF8081	Soft Computing	3	0	0	3
26.	IF8082	Software Quality and Testing	3	0	0	3
27.	IF8083	Unix Internals	3	0	0	3
28.	IF8084	Adhoc and Sensor Networks	3	0	0	3
29.	IF8253	GPU Architecture and Programming	3	0	0	3
30.	IF8351	Virtualization	3	0	0	3
31.	MG8071	Operations Research	3	0	0	3
32.	MM8071	Digital Video Processing	3	0	0	3
33.	MM8252	Video Analytics	3	0	0	3

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IF8101 **ADVANCED DATABASES** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES 9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III INTELLIGENT DATABASES 9

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules-Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures- Spatial Access Methods- Spatial DB Implementation.

UNIT IV ADVANCED DATA MODELS 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

UNIT V EMERGING TECHNOLOGIES 9

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2008.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Fourth Edition, Pearson Education, 2008.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
4. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, “Advanced Database Systems”, Morgan Kaufmann publishers,2006.
6. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.
7. G.K.Gupta,”Database Management Systems”, Tata McGraw Hill, 2011.

IF8102 NETWORK ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To provide an introduction to the principles and practices of Network Engineering.
- To understand the architecture of the network devices.
- To learn QoS related methodologies.
- To explore the emerging technologies in network engineering.

UNIT I FOUNDATIONS OF NETWORKING 9

Communication Networks – Network Elements – Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching - Error and Flow Control – Congestion Control –
Layered Architecture – Network Externalities – Service Integration.

UNIT II QUALITY OF SERVICE 9

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping Policies for BE and GS models – Traffic Shaping Algorithms – End to End Solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in Inelastic Traffic

UNIT III HIGH PERFORMANCE NETWORKS 9

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behavior – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP.

UNIT IV NETWORK DEVICE ARCHITECTURE 9

Network Devices – Switch – Router – Hardware Components- Software – Configuration – Routing Concepts- Static Routing – Dynamics Routing – Routing Information Protocol – Configuration – Open Shortest Path First Protocol – Configuration – Access Control List – Standard – Extended – Named. Multiplexers, Modems and Internet Access Devices – Switching and Routing Devices- Router Structure - Configuring EGP –RIP – OSPF – IS-IS - Hub - Bridges – Routers – Link Virtualization - Multicast Architecture.

UNIT V SOFTWARE DEFINED NETWORKING **9**

History - Data Plane Support for SDN - Software Routers – Programmable Hardware –Control Plane Support for SDN - Modern SDN Stack - Programming Languages – Applications – Data Centre Networking –Software Defined Radio –Campus Networks.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain an understanding of the principles of network engineering.
- Knowledge of advanced network engineering concepts and techniques.
- Capability development includes gaining an understanding of network engineering principles for network, system and service management.

REFERENCES:

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education/PHI, 2009.
2. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fifth Edition, Morgan Kaufman Publishers, 2012.
3. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
4. James Macfarlane ," Network Routing Basics: Understanding IP Routing in Cisco Systems", Wiley edition 1 2006.
5. Wendell Odom and Rick McDonald, "Routers and Routing Basics CCNA 2 Companion Guide (Cisco Networking Academy)", Cisco press, 2006.

IF8151 ADVANCED COMPUTER ARCHITECTURE **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the evolution of computer architecture.
- To understand the state-of-the-art in computer architecture.
- To understand the design challenges in building a system.

UNIT I PIPELINING AND ILP **11**

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors – Case Studies.

UNIT II THREAD-LEVEL PARALLELISM **8**

Multi-threading – Multiprocessors - Centralized and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency - Interconnection Networks – Buses, Crossbar and Multi-Stage Switches – Multi-Core Processor Architectures - Case Study.

UNIT III SIMD AND GPU ARCHITECTURES **8**

SIMD Extensions for Multimedia – Graphics Processing Units – GPU Computational Structures – GPY ISA – GPU Memory Structures – Case Study.

UNIT IV MEMORY HIERARCHY DESIGN 9

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations – Name Mapping Implementations - Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

UNIT V WAREHOUSE-SCALE COMPUTERS 9

Programming Models and Workloads – Storage Architectures – Physical Infrastructure – Cloud Infrastructure – Case Study

TOTAL: 45 PERIODS

OUTCOMES:

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

- Compare and evaluate the performance of various architectures.
- Design sub-systems to meet specific performance requirements.
- Analyze the requirements of large systems to select and build the right infrastructure.

REFERENCES:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier, Fifth edition, 2012.
2. Richard Y. Kain, “Advanced Computer Architecture a Systems Design Approach”, PHI, 2011.

IF8152 ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS L T P C

3 0 0 3

OBJECTIVES:

- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations.
- To learn the usage of graphs and strings and its applications.
- To select and design data structures and algorithms that is appropriate for problems.
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING 9

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

UNIT II HIERARCHICAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion- B-Trees: Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Binomial Heaps: Binomial Trees and Binomial Heaps – Operations on Binomial Heaps

UNIT III GRAPHS & STRINGS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra’s Algorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm; Maximum Flow: Flow Networks – The Ford-Fulkerson method – Maximum Bipartite Matching; String Matching: The Native String-Matching Algorithm – The Knuth-Morris-Pratt Algorithm

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy – Huffman Codes

UNIT V NP COMPLETE AND NP HARD 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems

TOTAL: 45 PERIODS

OUTCOMES:

- Design data structures and algorithms to solve computing problems.
- Become familiar with the specification, usage, implementation and analysis of hierarchical data structures and algorithms.
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems.
- Apply suitable design strategy for problem solving.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Second Edition, Prentice-Hall.
2. Robert Sedgewick and Kevin Wayne, “Algorithms”, Fourth Edition, Pearson Education.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
4. Donald E Knuth, “Art of Computer Programming-Volume I- Fundamental Algorithms”, Third edition, Addison Wesley, 1997.

MA8160 PROBABILITY AND STATISTICAL METHODS L T P C

3 1 0 4

OBJECTIVE:

- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

UNIT I ONE DIMENSIONAL RANDOM VARIABLES 9+3

Random Variables - Probability Function – Moments – Moment Generating Functions and Their Properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal Distributions – Functions of a Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint Distributions – Marginal and Conditional Distributions – Functions of Two Dimensional Random Variables – Regression Curve – Correlation.

UNIT III ESTIMATION THEORY 9+3

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of Least Squares – Regression Lines.

UNIT IV TESTING OF HYPOTHESES 9+3

Sampling Distributions - Type I and Type II Errors - Tests based on Normal, t,2 and F Distributions For Testing Of Mean, Variance And Proportions – Tests for Independence of Attributes and Goodness of Fit.

UNIT V MULTIVARIATE ANALYSIS 9+3

Random Vectors and Matrices - Mean Vectors and Covariance Matrices - Multivariate Normal Density and Its Properties - Principal Components: Population Principal Components - Principal Components from Standardized Variables.

TOTAL:45+15:60 PERIODS

OUTCOME:

- The course provides the basic concepts of Probability and Statistical techniques for solving mathematical problems which is useful in solving engineering problems.

REFERENCES:

1. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Thomson and Duxbury, 2002.
2. Richard Johnson. "Miller & Freund's Probability and Statistics for Engineer", Prentice Hall , Seventh Edition, 2007.
3. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Fifth Edition, 2002.
4. Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan and Sons, 2001.
5. Dallas E Johnson et al., "Applied multivariate methods for data analysis", Thomson and Duxbury press, 1998.

MM8163 SOFTWARE ENGINEERING METHODOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To provide information about wider engineering issues that form the background in developing complex, evolving (software-intensive) systems.
- To plan a software engineering process that account for quality issues and non-functional requirements;
- To employ a selection of concepts and techniques to complete a small-scale analysis and design in mini projects.
- To impart knowledge and to translate requirement specifications into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- To provide basic knowledge about software project management.

UNIT I SOFTWARE PRODUCT AND PROCESS 9

Introduction – S/W Engineering Paradigm – Verification – Validation – Life Cycle Models – Component Based Design - System Engineering – Business Process Engineering Overview – Product Engineering Overview – Agile Methods – Open Source Software Development - Crowd Sourcing.

UNIT II SOFTWARE REQUIREMENTS 9

Systems Engineering - Analysis Concepts - Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary.

UNIT III DESIGN CONCEPTS AND PRINCIPLES 9

Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System.

UNIT IV TESTING 9

Taxonomy of Software Testing – Types of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based on Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques.

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Measures and Measurements – ZIPF's Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Implement mini projects incorporating the basic principles of software engineering.
- Familiar with the basic concepts of software design, implementation.
- Familiar with software testing of simple mini projects.
- Familiar with the Rational Rose and its equivalent open source tools for understanding basic software engineering concepts.
- Design and implement some basic cost estimation models.
- Critically analyze and apply software project management principles in simple projects.

REFERENCES:

1. Ian Sommerville, "Software engineering", Ninth Edition, Pearson Education Asia, 2010.
2. Roger S. Pressman, "Software Engineering – A practitioner's Approach", Seventh Edition, Tata McGraw-Hill International Edition, 2009.
3. Watts S.Humphrey,"A Discipline for Software Engineering", Pearson Education, 2008.
4. James F.Peters and Witold Pedrycz, "Software Engineering, Engineering Approach", Wiley-India, 2007.
5. Stephen R.Schach, "Software Engineering", Seventh Edition, Tata McGraw-Hill Publishing Company Limited, 2006.
6. Ivar Jacobson, "Object Oriented Software Engineering", Pearson Education,1992
7. Pankaj Jalote, "An Integrated Approach to Software Engineering", Third Edition, Narosa publications, 2011.

IF8111 DATA STRUCTURES LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To acquire the knowledge of using advanced tree structures.
- To learn the usage of heap structures.
- To understand the usage of graph structures and spanning trees.
- To learn the working of various string matching algorithms

EXPERIMENTS:

1. Implementation of a Binary Search Tree
2. Red-Black Tree Implementation
3. Heap Implementation
4. Binomial Heaps
5. Graph Traversals
6. Spanning Tree Implementation
7. Shortest Path Algorithms
8. String Matching Algorithms
9. Approximation Algorithms

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design and implement basic and advanced data structures extensively.
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems.
- Design and develop efficient algorithms with minimum complexity.

IF8112 NETWORKING AND DBMS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To learn network programming and establish connection between network.
- To acquire knowledge about various networking tools.
- To study the design of databases for applications.
- To practice DBMS query language such as SQL and embedded programming.

EXERCISES:

1. Client-server programming
2. Socket programming (TCP/UDP)
3. Network analyzer
4. Traffic Analysis
5. Protocol Analysis
6. Study of Software Defined Networking tools
7. Data Definition, Manipulation of Tables and Views
8. Database Querying – Simple queries, Nested queries, Sub queries and Joins
9. Triggers
10. Transaction Control
11. Embedded SQL
12. Database Connectivity with Front End Tools
13. Front End Tools / Programming Languages
14. High level language extensions - PL/SQL Basics
15. Procedures and Functions
16. Database Design and Implementation (Case Study)

TOTAL: 45 PERIODS

OUTCOMES:

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

- To gain knowledge about network connectivity and network components.
- To design databases for various applications.

IF8201 **DATA ANALYTICS** **L T P C**
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To learn various techniques for mining data streams.
- To learn Event Modeling for different applications.

UNIT I INTRODUCTION TO BIG DATA **8**

Introduction to Big Data Platform – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II DATA ANALYSIS **12**

Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT III MINING DATA STREAMS **8**

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT IV FREQUENT ITEMSETS AND CLUSTERING **9**

Mining Frequent Itemsets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism.

UNIT V FRAMEWORKS AND VISUALIZATION **8**

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Applications.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Model a framework for Human Activity Recognition.

REFERENCES:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
4. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007
5. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
6. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008**.**

IF8202 **WEB INTEGRATED TECHNOLOGIES** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the issues in the design of web application development.
- To learn the concepts of client side and server side technologies.
- To learn the concept of three tier application using MVC.
- To understand and learn the importance of Java based security solutions.
- To learn the concepts of software components using EJB.
- To learn the concept of other framework.

UNIT I WEB DESIGN PRINCIPLES **9**

Web Engineering and Application Development – Introduction – Challenges and Role of Web Engineering – Web Design Methods – Design Issues – OOWS Model Driven approach – OOHDM – UML based Web Engineering – Designing Multichannel Web Application – Designing Web Application with Web ML and Web Ratio – Semantic Web Information System - Quality Evaluation and Experimental Web Engineering – Measuring and Evaluating Web Application – Need for Empirical Web Engineering

UNIT II WEB APPLICATION DEVELOPMENT **9**

Web Technology Basics – HTML5 – Cascading Style Sheet – Client side scripting – JavaScript – JavaScript Objects – XML Basics – DOM – SAX – XSL – AJAX – RSS – Database Connectivity – Server Side Scripting – Servlet – Servlet Life Cycle – Servlet based Web Application – JSP – PHP – ASP.NET – Case Study

UNIT III ENTERPRISE APPLICATION DEVELOPMENT **9**

Three Tier Architecture – Working With Model-View-Controller – JCP – J2EE - XML Based APIs – Application Servers - Presentation Tier and EIS Tier – Java Mail – JMS – Java Transactions – JNDI – Java Authentication and Authorization Services – Java Cryptography

UNIT IV COMPONENTS AND FRAMEWORKS **9**

Service Tier And Data Tier – EJB Architecture – Session Beans – Entity Beans – Message Driven Beans – J2EE Connector Architecture - Web Services – J2EE Web Services – Patterns – Presentation, Service Tier and Data Tier Patterns – J2ME - Struts – Hibernate – Spring

UNIT V SOA BASICS **9**

SOA Principles – Evolution of SOA – SOA and WS_Extension – Service Activity – Coordination – Transaction – Orchestration – Choreography – Security – Advanced Messaging - Notification and Eventing - Case Studies – Current Trends

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design and development of web applications using various models.
- Web application development using HTML and scripting technologies.
- Web application development using advanced features.
- Security features supported in java.
- Developing web services using J2EE and related technologies.
- Design and development of applications using other frameworks.

REFERENCES:

1. Gustavo Rossi, Oscar Pastor, Daniel Schwabe, Luis Olsina, “Web Engineering Modeling and Implementing web Applications”, Springer, 2008.
2. Thomas Erl, “Service Oriented Architecture, Concepts, Technology, and Design”, Pearson, 2005.
3. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, “Java Web Services Architecture”, Elsevier, 2003.

IF8251 ADVANCED OPERATING SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of Operating system.
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols.
- To know the components and management aspects of Real time, Mobile operating systems.

UNIT I OPERATING SYSTEM BASICS 9

Overview – Synchronization Mechanisms – Process and Threads- Process Scheduling – Deadlocks: Detection – Prevention- Recovery – Models of Resources – Memory Management.

UNIT II DISTRIBUTED OPERATING SYSTEM 9

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport’s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File System – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT IV REAL TIME & MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT V CASE STUDIES 9

Linux System: Design Principles - Kernel Modules - Process Management Scheduling - Memory Management - Input-Output Management - File System - Interprocess Communication. Windows XP: Design Principles - System Components - Process and Thread Management - Memory Management - File System. iphone iOS4: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL:45 PERIODS

OUTCOMES:

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

- A complete overview of process management & memory management of Operating system.
- Ability to demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system.

REFERENCES:

1. Mukesh Singhal, Niranjan G Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
3. Andrew S.Tanenbaum, “Modern Operating System”, Third Edition, Prentice Hall Inc., 2008.
4. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.
5. H M Deital, P J Deital and D R Choffnes, “Operating Systems”, Pearson Education, 2004.
6. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.

IF8252 CLOUD COMPUTING TECHNOLOGIES L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept of cloud and utility computing.
- To understand the various issues in cloud computing.
- To familiarize themselves with the state of the art in cloud
- To appreciate the emergence of cloud as the next generation computing paradigm.
- To be able to set up a private cloud.

UNIT I INTRODUCTION 8

Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture -IaaS – On-demand Provisioning – Elasticity in Cloud – E.g. of IaaS Providers - PaaS – E.g. of PaaS Providers - SaaS – E.g. of SaaS Providers – Public , Private and Hybrid Clouds.

UNIT II VIRTUALIZATION 9

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Desktop Virtualization – Server Virtualization.

UNIT III CLOUD INFRASTRUCTURE 9

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV PROGRAMMING MODEL 10

Parallel and Distributed Programming Paradigms – Map Reduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack.

UNIT V SECURITY IN THE CLOUD **9**

Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability
- Choose the appropriate technologies, algorithms and approaches for the related issues

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
4. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly, 2009.
5. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
6. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer, 2010.

IF8254 MOBILE AND PERVASIVE COMPUTING **L T P C**

3 0 0 3

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.

UNIT I INTRODUCTION **9**

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

UNIT II 3G AND 4G CELLULAR NETWORKS **9**

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 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 Aspects of 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 Aware Computing – 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 – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To deploy 3G networks.
- To develop suitable algorithms for 4G networks.
- To use sensor and mesh networks to develop mobile computing environment.
- To develop mobile computing applications based on the paradigm of context aware computing.

REFERENCES:

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’, Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein, ‘Fundamentals of Mobile and Pervasive Computing’, TMH, 2005
5. Jochen Burthardt et al, ‘Pervasive Computing: Technology and Architecture of Mobile Internet Applications’, Pearson Education, 2003
6. Feng Zhao and Leonidas Guibas, ‘Wireless Sensor Networks’, Morgan Kaufmann Publishers, 2004
7. Uwe Hansmaan et al, ‘Principles of Mobile Computing’, Springer, 2003
8. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
9. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and Interactions”, Wiley, 2009.

IF8211 OS AND MOBILE LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To know about various platforms and tools available for developing mobile applications.
- To realize the differences between developing conventional applications and mobile applications.
- To learn programming skills in J2ME and Android SDK.
- To study about micro browser based applications to access the Internet using Sun Java Toolkit.

EXPERIMENTS:

1. Implementation of Process scheduling algorithms.
2. Simulation of Deadlock detection, prevention and recovery process.
3. Implementation of Distributed mutual exclusion Algorithms.
4. Implementation of Distributed OS Agreement protocols.
5. Implementation of Distributed OS Resource Scheduling algorithms
6. Two-Phase Commit Protocol in Distributed OS.
7. IOS app development.
8. Survey of Mobile Application Development Tools
9. Form design for mobile applications
10. Applications using controls
11. Graphical and Multimedia applications
12. Data retrieval applications
13. Networking applications
14. Gaming applications
    (Perform the experiments from 2 to 7 in J2ME and Android SDK framework)
15. Micro browser based applications using WAP, WML and WML scripts
    (Perform experiments in 8 using Sun Java Wireless toolkit)

TOTAL: 45 PERIODS

OUTCOMES:

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

- Develop useful mobile applications for the current scenario in mobile computing and pervasive computing

IF8212 WEB INTEGRATED TECHNOLOGIES LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To learn how to create a simple web page using HTML along with the usage of style sheets, lists, creation or tables with borders, padding and colors.
- To get acquainted with JavaScript and how to embed JavaScript in HTML code.
- To construct dynamic server-side web pages and integrate the web application with many of the other Java2 Enterprise Edition application server methodologies.
- To develop Java Enterprise Applications using EJB3 and other Java EE technology and J2ME.

EXPERIMENT

1. Web programming with HTML tags, CSS for styling, Page layout
2. Develop webpage using JavaScript for client side programming and HTML forms
3. Using The DOM and the JavaScript object models
4. Website optimization: crunching HTML, using CSS to replace HTML and light-weight graphics to speed up websites
5. Creating XML file with XML DTD and XML schema, SAX, XSL
6. Web site creation with PHP for server side programming for storing current date-time using cookies and for storing page views using sessions
7. Web application development using Servlet/ PHP/ JSP/ ASP.NET
8. Working with PHP and MySQL.
9. Constructing dynamic server-side web pages using JSF and integrate the Web application with many of the other Java2 Enterprise Edition application server methodologies such as Enterprise Java Beans, JavaMail, and SOAP.
10. Developing Java Enterprise Applications Using EJB3 Session beans, entity beans and message-driven beans.

11. Working with JNDI, JDBC and JMS.
12. Application development using J2ME.

OUTCOMES:

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

- Web application development using HTML and scripting technologies.
- Hands on experience on Web application development using advanced features.
- Design and development of dynamic server-side web pages.
- Develop web services using J2EE and related technologies.
- Design and development of applications using other frameworks.

TOTAL : 45 PERIODS

IF8301 CRYPTOGRAPHY AND INFORMATION SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To understand the mathematics behind Cryptography.
- To understand the standard algorithms used to provide confidentiality, integrity and authenticity.
- To get the knowledge of various security practices applied in the field of information technology.

UNIT I FUNDAMENTALS AND MATHEMATICS OF CRYPTOGRAPHY 9

Overview - Classical Crypto Systems – Substitution Ciphers –Transposition Ciphers- Stream and Block Ciphers – Introduction to Number Theory – Congruences – Chinese Remainder theorem – Modular Arithmetic-Modular Exponentiation – Fermats and Eulers Theorem - Finite Fields – GF(2^n) Fields.

UNIT II ENCRYPTION TECHNIQUES 9

Symmetric Encryption Techniques – DES – AES- Public-Key Cryptography and RSA – Key Management - Diffie-Hellman Key Exchange – Elliptic Curve Cryptography – Symmetric Key Distribution – Kerberos - X.509 Authentication Service - differential cryptanalysis - linear cryptanalysis - side channel attack - lattice reduction attack - Merkle-Hellman knapsack attack - Hellman's time-memory tradeoff (TMTO) attack

UNIT III HASH FUNCTIONS AND SIGNATURES 9

Message Authentication and Hash Functions – Description of MD Hash Family – Secure Hash Algorithms – SHA 512 - Digital Signatures and Authentication Protocols – Digital Signature Standard – Process, Services, Attacks on Digital Signature- Digital Signature Schemes.

UNIT IV SECURITY PRACTICES 9

Vulnerability Analysis - Flaw Hypothesis Methodology, NRL taxonomy and Aslam's model - Auditing - Anatomy of an Auditing System - Design of Auditing Systems - Posteriori Design - Auditing mechanisms - Risk Analysis and Management - Disaster Recovery Planning/Incident Response Planning - Intrusion Detection System

UNIT V SECURE DEVELOPMENT **9**

Secure Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls - Secure Software Development Life Cycle - Testing, Maintenance and Operation - Evaluation of Security Systems

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply the basic security algorithms required by any computing system.
- Predict the vulnerabilities across any computing system and hence be able to design a security solution for any computing system.

REFERENCES:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education, Fourth Edition, 2006.
2. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007.
3. Mark Stamp, "Information Security: Principles and Practice", Wiley Inter Science, 2011.
4. OWASP top ten security vulnerabilities: http://xml.coverpages.org/OWASP-TopTen.pdf
5. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.

IF8001 3G AND 4G WIRELESS NETWORKS **L T P C**
3 0 0 3

OBJECTIVES:

- To learn various generations of wireless and cellular networks.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.
- To study about Wi MAX networks, protocol stack and standards.
- To understand about the emerging trends of smart phones and evolution of latest standards like DLNA and NFC.

UNIT I INTRODUCTION **9**

Introduction: History of Mobile Cellular Systems - First Generation - Second Generation - Generation 2.5 - Overview of 3G & 4G. 3GPP and 3GPP2 standards

UNIT II 3G NETWORKS **9**

Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA- CDMA 1X - EVDO Rev -0, Rev-A, Rev-B, Rev-C Architecture- Protocol stack.

UNIT III 4G LTE NETWORKS **9**

LTE: Introduction, Radio interface architecture - Physical layer, Access procedures - System Architecture Evolution (SAE) - Communication protocols – Interfaces.

UNIT IV WIMAX NETWORKS **9**

Introduction – IEEE 802.16 – Frame Format – Protocols - OFDM – MIMO - IEEE 802.20- Applications.

UNIT V DLNA & NFC REVOLUTION **9**

Introduction and Evolution - Applications of DLNA and NFC - DLNA Architecture and Protocol stack - Smart phone and NFC – Mobile Commerce and NFC – NFC tags –Security Issues.

TOTAL:45 PERIODS

OUTCOMES:

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

- Conversant with the latest 3G/4G and WiMAX networks and its architecture.
- Design and implement wireless network environment for any application using latest wireless protocols and standards.
- Implement different type of applications for smart phones and mobile devices with latest network strategies.

REFERENCES:

1. Juha Korhonen, “Introduction to 3G Mobile Communication”, Artech House, 2003
2. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming , “3G Evolution HSPA and LTE for Mobile Broadband”, Academic Press, 2008
3. Flavio Muratore, “UMTS Mobile Communication for the Future”, John Wiley & Sons , 2001
4. Harri Holma and Antti Toskala, “HSDPA/HSUPA for UMTS”, Johan Wiley & Sons, 2006.

IF8002 BUILDING INTERNET OF THINGS **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino or equivalent boards.
- To apply the concept of Internet of Things in the real world scenarios.

UNIT I INTRODUCTION **9**

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security - privacy

UNIT II COMPONENTS IN INTERNET OF THINGS **9**

Control Units – Sensors – Communication modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication

UNIT III PROGRAMMING THE MICROCONTROLLER FOR IOT **9**

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors

UNIT IV COMMUNICATION **9**

Connecting microcontroller with mobile devices – communication through bluetooth and USB – connection with the internet using wifi / ethernet

UNIT V APPLICATIONS **9**

set up cloud environment – send data from microcontroller to cloud – Case studies – Open Source e-Health sensor platform – BeClose Elderly monitoring – Other recent projects.

OUTCOMES:

- Design a portable IoT using Arduino/ equivalent boards.
- Construct the basic IoT circuit.
- Establish the communication to the cloud through WIFI/ Bluetooth.
- Outline the applications of IoT in real time scenarios.

REFERENCES:

1. Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002
2. http://postscapes.com/
3. http://www.theinternetofthings.eu/what-is-the-internet-of-things

IF8003 COMPUTER GRAPHICS AND MULTIMEDIA L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts of graphics designs.
- To familiarize the student with the transformation and projection techniques.
- To expose the student to various color models.
- To appreciate the use of multimedia authoring tools and multimedia compression techniques.

UNIT I INTRODUCTION TO GRAPHICS 9

Introduction - Design and Drawing - Pictures Storage and Display - Basic Graphics Pipeline, Bitmap and Vector- Based Graphics - Attributes of output primitives – Line, Circle and Ellipse drawing algorithms and Other Conics.

UNIT II TRANSFORMATION AND PROJECTION 9

Two dimensional Geometric Transformation – Camera View Port – Viewing Pipeline -Viewing Transformation - Parallel and Perspective Viewing and Projections - Three Dimensional Object Representation –Visualization of Data Sets – Visible Surface Identification - Three-Dimensional Transformations - Two- Dimensional Clipping - Polygon Clipping - Clipping In Three Dimensions - Text Clipping.

UNIT III CURVE AND SURFACE DESIGN AND COLOUR MODELS 9

Parametric Curve Design - Spline Curve Representation - Bezier Curves - B-Spline Curves and Surface Design - Constructive Solid Geometry - Color Models – RGB – YIQ – CMY - HSV – Animations – General Computer Animation, Raster - Key Frame - Graphics Programming using OPENGL – Basic Graphics Primitives – Drawing Three Dimensional Objects - Drawing Three Dimensional Scenes.

UNIT IV MULTIMEDIA AUTHORING AND DATA REPRSENTATIONS 9

Introduction to Multimedia – Multimedia Authoring Tools – Graphics and Image Data Representations – Basics of Digital Video – Types of Video Signals – Analog and Digital Video – Digitization of Sound – Quantization and Transmission of Audio - MIDI.

UNIT V MULTIMEDIA DATA COMPRESSION 9

Lossless and Lossy Compression Algorithms – Image Compression Standards – Basic Audio and Video Compression Techniques – MPEG Audio and Video Coding – Computer and Multimedia Networks – Content Based Retrieval.

TOTAL:45 PERIODS

OUTCOMES:

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

- Implement basic graphics transformation and projection techniques.
- Design an application that incorporates different concepts of various color models.
- Apply and explore new techniques in the areas of compression techniques.

REFERENCES:

1. Donald Hearn, Pauline Baker, "Computer Graphics – C Version", Second Edition, Pearson Education,2004.
2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics- Principles and Practice", Second Edition in C, Pearson Education, 2007.
3. F.S. Hill, "Computer Graphics using OPENGL", Second Edition, Pearson Education, 2003.
4. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", Prentice Hall, 2004.

IF8004 CYBER FORENSICS L T P C
3 0 0 3

OBJECTIVES:

- To study the fundamentals of computer forensics.
- To have an overview of techniques for Data Recovery and Evidence Collection.
- To study various threats associated with security and information warfare.
- To study the tools and tactics associated with cyber forensics.

UNIT I INTRODUCTION 7

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.

UNIT II COMPUTER FORENSICS EVIDENCE AND CAPTURE 8

Data Recovery – Evidence Collection and Data Seizure –Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

UNIT III COMPUTER FORENSIC ANALYSIS 10

Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military–Tactics of Terrorist and Rogues – Tactics of Private Companies.

UNIT IV INFORMATION WARFARE 10

Arsenal – Surveillance Tools- Hackers and Theft of Components- Contemporary computer Crime Identity Theft and Identity Fraud-Organized Crime & Terrorism Avenues Prosecution and Government Efforts- Applying the First Amendment to Computer Related Crime-The Fourth Amendment and Other Legal Issues.

UNIT V COMPUTER FORENSIC CASES 10

Developing Forensic Capabilities- Searching and Seizing Computer Related Evidence-Processing Evidence and Report Preparation - Future Issues.

TOTAL:45 PERIODS

OUTCOMES:

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

- To apply the concepts of computer forensics.
- To handle threats associated with security and information warfare.
- To design tools and tactics associated with cyber forensics.

REFERENCES:

1. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation, Volume1, Cengage Learning, 2005
2. Marjie T Britz , "Computer Forensics and Cyber Crime: An Introduction, 2/e,Pearson Education, 2008.
3. Marie-Helen Maras, "Computer Forensics: Cybercriminals, Laws, and Evidence", Jones & Bartlett Publishers, 2011.
4. Chad Steel, "Windows Forensics", W iley India, 2006.Majid Yar, "Cybercrime and Society", Sag e Publications, 2006.Robert M Slade, "Software Forensics", Tata Mc Graw Hill, 2004.

IF8005 DESIGN OF SOFTWARE AGENTS L T P C
3 0 0 3

OBJECTIVES:

- To learn the principles and fundamentals of designing agents.
- To analyze architecture design of different agents.
- To understand user interaction with agents.

UNIT I INTRODUCTION 9

Agents and Multi Agent Systems- Intelligent Agent- Concepts of Building Agent – Situated Agents – Proactive and Reactive agents- Challenging Agent Environment- Social Agents- Agent Execution Cycle- Prometheus Methodology- Guidelines for using Prometheus- Agent Oriented Methodologies- System Specification – Goal Specification – Functionalities – Scenario Development – Interface Description – Checking for Completeness and Consistency.

UNIT II ARCHITECTURAL DESIGN 9

Agent Types - Grouping Functionalities - Agent Coupling - Develop Agent Descriptors - Interactions - Interaction Diagram from Scenarios- Interaction Protocol from Interaction Diagram- Develop Protocol and Message Descriptors –Architectural Design - Identifying the Boundaries of Agent System – Percepts and Action - Shared Data Objects – System Overview – Checking for Completeness and Consistency.

UNIT III DETAILED DESIGN 9

Capability Diagrams – Sub Tasks - Alternative Programs – Events and Messages – Action and Percept Detailed Design – Data – Develop and Refine Descriptors – Missing or Redundant Items- Consistency between Artifacts – Important Scenarios- Implementing Agent Systems - Agent Platform – JACK

UNIT IV AGENTS AND USER EXPERIENCE 9

Interact with Agents - Agents from Direct Manipulation to Delegation – Interface Agents - Designing Agents - Direct Manipulation versus Agents- Agents for Information Sharing and Coordination- Agents that Reduce Work and Information Overload - KidSim: Programming Agents without a Programming Language.

UNIT V AGENTS FOR INTELLIGENT ASSISTANCE 9

Computer Characters- Software Agents for Cooperative Learning – Integrated Agents- Agent Oriented Programming- KQML as an Agent Communication Language- Agent Based Framework for Interoperability - Agents for Information Gathering - KAoS- Communicative Actions for Artificial Agents – Mobile Agents.

TOTAL:45 PERIODS

OUTCOMES:

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

- Implement a architecture design for an agent.
- Implement communicative actions with agents.
- Use a tool to implement typical agents for different types of applications.

REFERENCES:

1. Lin Padgham and Michael Winikoff, “Developing Intelligent Agent Systems: A Practical Guide”, John Wiley & sons Publication, 2004.
2. Jeffrey M. Bradshaw, “Software Agents”, MIT Press, 1997.
3. Steven F. RailsBack and Volker Grimm, “Agent-Based and Individual Based modeling: A Practical Introduction”, Princeton University Press, 2012.

IF8006 E-LEARNING L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about modern technology for learning.
- To acquaint with the E-Learning Tools.
- To learn technologies involved in E-learning application development.
- To become aware of the current business potential of E-learning based business.

UNIT I INTRODUCTION 9

Introduction – Learning - the role of Training - the role of E-Learning – New Era - E-Learning Revolution - E-Learning Strategy

UNIT II KNOWLEDGE MANAGEMENT 9

Computer Based Training – Pitfalls - classroom course to the web-case study - knowledge Management – types – benefits - knowledge management pyramid - community and collaboration in knowledge management - knowledge management for professionals – services - building knowledge management solution

UNIT III E-LEARNING ARCHITECTURE 9

Integrating E-Learning and Classroom Learning - building Learning Architecture - Learning Architecture for - sales development - financial consultants - initial call center training, executives - E-Learning Applications

UNIT IV LEARNING MANAGEMENT SYSTEM 9

Building and Managing an E-Learning Infrastructure - Learning portals - Learning Management Systems (LMS) - Building Learning Culture – strategies - E-Learning costs – justification - Quality – demonstration - E-Learning- service – speed evaluation

UNIT V CASE STUDY 9

Reinventing the Training Organization – Training at CISCO System – case study - creating E-learning strategy for self – future of E-learning.

TOTAL:45 PERIODS

Attested

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Centre For Academic Courses
Anna University, Chennai-600 025.

OUTCOMES:

Upon completion of this course, students should be able to:

- Work with technologies involved in E-Learning Applications.
- Design and develop E-Learning application and work with E-Learning tools.

REFERENCES:

1. Marc J.Rosenberg, "E-Learning: Strategies for Delivering Knowledge in the Digital Age", McGraw Hill, 2001.
2. Safeeullah Soomro, "E-Learning Experiences and Future", In Tech Publication, 2010
3. Frank Rennie, "E-Learning and Social Networking Handbook – Resources for Higher Education" , Tara Morrison, 2012
4. Saul Carliner and Patti Shank, "The E-Learning Handbook: Past Promises, Present Challenges", Pfeiffer Publication, 2008.

IF8007 GREEN COMPUTING L T P C
3 0 0 3

OBJECTIVE:

- To introduce the concept of green computing.
- To create awareness of energy efficient computing.
- To understand the power management in computing devices
- To analyze the consumption of power in data centers

UNIT I INTRODUCTION 9

Energy- efficient – power efficient and thermal aware computing and communication - Newton's cooling model and basic thermodynamics and sustainability.

UNIT II POWER MANAGEMENT 9

Operating system Directed power management – Power management history and motivation – key power management concepts – power management scenarios – ACPI desktop motherboard design

UNIT III DEVELOPMENT OF EFFICIENT POWER MANAGEMENT SYSTEM 9

Dual mode desktop power delivery – system BIOS – Designing mobile systems - Communication with peripheral devices – Drivers – Developing robust power managed applications

UNIT IV ENERGY EFFICIENT DATA CENTER 9

Data center power consumption – Power metrics – Energy efficient data center tuning - energy efficient server management – Industry vision and recommendations

UNIT V CASE STUDIES AND APPLICATION 9

Google green datacenter - IBM green technology - Microsoft – Case Studies – Applying Green IT Strategies and Applications to a Home – Hospital - Packaging Industry and Telecom Sector.

TOTAL:45 PERIODS

OUTCOMES:

- Identify the benefits and challenges of energy efficient computing.
- Develop energy efficient computing applications.
- Apply the strategies of going Green.

REFERENCES:

1. Jerzy Kolinski, Ram Chary, Andrew Henroid, and Barry Press, “Building the Power-Efficient PC A Developer's Guide to ACPI Power Management”, Intel Press August 2001.
2. Lauri Minas, Brad Ellison, “Energy Efficiency for Information Technology: How to Reduce Power Consumption in Servers and Data Centers”, Intel Press, 2009.
3. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011.
4. Wu Chun Feng, “Green Computing: Large-Scale Energy Efficiency”, CRC Press INC, 2013.

IF8008 GRID COMPUTING L T P C
3 0 0 3

OBJECTIVES:

- To understand Grid Architecture.
- To understand different types of grids.
- To know Grid standards.
- To acquire the knowledge of Grid computing in various areas.

UNIT I INTRODUCTION 9

Parallel and Distributed Computing - Cluster Computing - Grid Computing Anatomy and Physiology of Grid - Web and Grid Services.

UNIT II FRAMEWORK 9

Architecture – Implementation of Grid Architecture – Grid Services OGSI, OGSA, WSRF –Grid Resource and Service Management –Resource Management Framework – Service Negotiation and Acquisition Protocol – Layers of Grid Computing – Building Reliable Services - Grid Monitoring – Sensors and Sensor Management - Grid Security – WS Security – GSI.

UNIT III DATA AND KNOWLEDGE GRID 9

Data Source – Collective Data Services - Data Management – Collective Data Management – Federation Services – Representing Knowledge – Processing Knowledge - Knowledge Oriented Grid.

UNIT IV GRID MIDDLEWARE 9

List of Globally Available Toolkits – GT3 – Architecture Details – Grid Service Container – OGSI Implementation – Security Infrastructure - System Level Services – Hosting Environments- Programming Model.

UNIT V APPLICATIONS 9

Scientific – Medical – Bioinformatics – Federated Computing – ERM – Multiplayer Games - Collaborative Science – Case Study.

TOTAL:45 PERIODS

OUTCOMES:

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

- Create Grid Middleware architecture.
- Explain the services offered by grid.
- To utilize grid for various applications.

REFERENCES:

1. Ian Foster, Carl Kesselman, "The Grid 2: Blueprint for a New Computing Infrastructure", Elsevier Series, Second edition, 2006.
2. Srikumar Venugopal, Krishna Nadiminti, Hussein Gibbins and Rajkumar Buyya, "Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience", Wiley Press, New York, USA, 2008.
3. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making the Global Infrastructure a Reality", Wiley, 2003.
4. Maozhen Li, Mark Baker, "The Grid: Core Technologies", Wiley, 2005.

IF8009 KNOWLEDGE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To learn about proposition logic and predicate logics.
- To acquire knowledge about modal and non monotonic logics.
- To apply object oriented abstractions for various expert systems.
- To understand various planning strategies for problem solving.

UNIT I INTRODUCTION AND PROPOSITION LOGIC 9

The Need for Formal Languages for Representing (Machine-Understandable) Knowledge - Reasoning Services and Logic-Based Reasoning - High Level Architecture of KR&R Systems - Propositional Logic - Syntax and Semantics of Propositional Logic – Reasoning in Proposition Logic - Limitations.

UNIT II FIRST ORDER PREDICATE LOGIC AND DERIVATIVES 9

Syntax and Semantics of First Order Logic - Knowledge Engineering using First Order Logic - Reasoning in First Order Logic - Normal Forms - Herbrand Interpretations and Herbrand's Theorem - Undecidability of the Satisfiability and Validity Problems -Resolution in First Order Logic - Description Logics as Fragments of First Order Logic -Syntax and Semantics – Reasoning with Description Logics.

UNIT III MODAL AND NON MONOTONIC LOGICS 9

Temporal Logic – Syntax and Semantics – KR using Temporal Logic – Epistemic Logic – Syntax and Semantics – KR using Epistemic Logic – Non Monotonic Logic- Uncertainty – Fuzzy logic.

UNIT IV OBJECT ORIENTED REPRESENTATION 9

Semantic Networks- Object Oriented Representations – Frame Formalism – Structured Descriptions – Meaning and Entailment - Taxonomies and Classification – Inheritance – Conceptual Dependency- Scripts – Expert Systems.

UNIT V ACTIONS AND PLANNING 9

Actions – Situational Calculus – Frame Problem – Representing Complex Actions – Planning – STRIPS/ ADL – Planning as Reasoning – Hierarchical and Conditional Planning.

TOTAL:45 PERIODS

OUTCOMES:

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

- To work with proposition logic and predicate logics.
- To develop intelligent systems using various AI techniques.
- To design successful plans to solve problems.

REFERENCES:

1. Ronald Brachman, Hector Levesque, “Knowledge Representation and Reasoning”, The Morgan Kaufmann Series in Artificial Intelligence, 2004.
2. Elaine Rich, S.Nair, “Artificial intelligence”, Third edition, Tata McGraw-Hill Education, 2010
3. John F. Sowa, “Knowledge Representation: Logical, Philosophical, and Computational Foundations”, 2000.
4. Arthur B. Markman, “Knowledge Representation”, Lawrence Erlbaum Associates, 1998.
5. S.C. Mehrotra, Ratnadeep R. Deshmukh, Sachin N. Deshmukh, Ramesh R. Manza, “Knowledge Engineering” , Alpha Science, 2011.

IF8010 SEMANTIC WEB L T P C
3 0 0 3

OBJECTIVES:

- To learn the importance of semantic web.
- To understand various semantic knowledge representation strategies.
- To learn the concepts of ontology.
- To learn the ontology related tools.

UNIT I INTRODUCTION 9

The Future of the Internet: Introduction - The Syntactic Web - The Semantic Web - How the Semantic Web Will Work. Ontology in Computer Science - Defining the Term Ontology - Differences among Taxonomies - Thesauri - and Ontologies, Classifying Ontologies - Web Ontologies, Web Ontology Description Languages - Ontology - Categories - and Intelligence.

UNIT II SEMANTIC KNOWLEDGE REPRESENTATION 9

Knowledge Representation in Description Logic – Introduction - An Informal Example - The Family of Attributive Languages - Inference Problems. RDF and RDF Schema – Introduction- XML Essentials- RDF- RDF Schema-A Summary of the RDF/RDF Schema Vocabulary. OWL-Introduction- Requirements for Web Ontology Description Languages- Header Information-Versioning- and Annotation Properties- Properties- Classes- Individuals- Data types- A Summary of the OWL Vocabulary.

UNIT III RULE LANGUAGES 9

Rule Languages – Introduction - Usage Scenarios for Rule Languages – Datalog – RuleML – SWRL - TRIPLE. Semantic Web Services – Introduction - Web Service Essentials - OWL-S Service Ontology - An OWL-S Example.

UNIT IV ONTOLOGY DEVELOPMENT 9

Methods for Ontology Development – Introduction - Uschold and King Ontology Development Method - Toronto Virtual Enterprise Method – Methontology - KACTUS Project Ontology Development Method – Lexicon -Based Ontology Development Method - Simplified Methods Ontology Sources – Introduction – Metadata - Upper Ontologies Other Ontologic of Interest - Ontology Libraries.

UNIT V SOFTWARE TOOLS 9

Semantic Web Software Tools – Introduction - Metadata and Ontology Editors – Reasoners - Other tools. Software Agents – Introduction - Agent Forms - Agent Architecture - Agents in the Semantic web Context. Semantic Desktop – Introduction - Semantic Desktop Metadata - Semantic Desktop Ontologies - Semantic Desktop Architecture - Semantic Desktop Related Applications. Ontology Application in Art – Introduction - Ontologies for the Description of Works of Art - Metadata Schemas for The Description of Works of Art - Semantic Annotation of Art Images.

TOTAL:45 PERIODS

OUTCOMES:

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

- Compare conventional web with semantic web.
- Analyze and design semantic knowledge representation modes.
- Construct ontology using different tools.
- Use semantic web services with web applications.

REFERENCES:

1. Karin K. Breitman, Marco Antonio Casanova and Walter Truszowski, “Semantic Web Concepts: Technologies and Applications”, Springer.
2. Heiner Stuckenschmidt, Frank van Harmelen,” Information Sharing on the Semanting Web,” Springer.
3. Grigoris Antoniou, Frank Van,”Semantic Web Primer”,
4. Rudi Studer, Stephan Grimm, Andrees Abeker,”Semantic Web Services: Concepts, Technologies and Applications”, Springer
5. John Davis, Dieter Fensal, Frank Van Harmelen,J. Wiley ,”Towards the Semantic Web: Ontology Driven Knowledge Management”,.

IF8011 TEXT MINING L T P C
3 0 0 3

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.

UNIT I INTRODUCTION 9

Overview of Text Mining - Document Classification - Information Retrieval - Clustering and Organizing Documents - Information Extraction - Prediction and Evaluation -Textual Information to Numerical Vectors - Collecting Documents - Document Standardization – Tokenization – Lemmatization - Vector Generation for Prediction - Sentence Boundary Determination - Evaluation Performance.

UNIT II INFORMATION RETRIEVAL AND TEXT MINING 9

Information Retrieval and Text Mining - Keyword Search - Nearest-Neighbor Methods - Measuring Similarity - Web-Based Document Search - Document–Matching - Inverted Lists - Evaluation of Performance - Structure in a Document Collection - Clustering Documents by Similarity- Evaluation of Performance - Information Extraction - Patterns and Entities from Text- Co reference and Relationship Extraction - Template Filling and Database Construction.

UNIT III CLUSTERING AND CLASSIFICATION 9

Cluster - Preserving Dimension Reduction Methods for Efficient Classification of Text Data - Dimension Reduction in the Vector Space Model - Orthogonal Basis of Centroids - Discriminant Analysis - Trace Optimization using an Orthogonal Basis of Centroids - Automatic Discovery of Similar Words **-** Simultaneous Clustering and Dynamic Weighting - Simultaneous Soft Clustering and Term Weighting - Robustness in the Presence of Noise - Feature Selection and Document Clustering.

UNIT IV LEARNING AND TEXT MINING 9

Vector Space Models (VSM) for Search and Cluster Mining - Major and Minor Cluster Discovery - Discovering Hot Topics from Dirty Text - Thesaurus Assistant- Sentence Identifier- Sentence Extractor- Mining Case Excerpts for Hot Topics -Combining Families of Information Retrieval Algorithms using Metalearning.

UNIT V TRENDS IN TEXT MINING 9

Trend and Behavior Detection from Web Queries - Query Data and Analysis- Vocabulary Growth - Technology Opportunities Analysis(TOA)- Constructive Collaborative Inquiry-based Multimedia E-Learning (CIMEL)- Timelines- New Event Detection- Themeriver- Patentminer- Summarization- Active Learning- Learning with Unlabeled Data- Different Ways of Collecting Samples- Question Answering - Case Studies - Market Intelligence from the Web - Lightweight Document Matching for Digital Libraries- Generating Model Cases for Help Desk Applications - Assigning Topics to New Articles - E-Mail Filtering - Search Engines - Extracting Named Entities from Documents- Customized Newspapers - Text Mining and Social Networks.

TOTAL:45 PERIODS

OUTCOMES:

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

- Identify the different features that can be mined from text and web documents
- Use available open source classification and clustering tools on some standard text data sets
- Modify existing classification/clustering algorithms in terms of functionality or features used
- Design a system that uses text mining to improve the functions of an existing open source search engine
- Implement a text mining system that can be used for an application of your choice

REFERENCES :

1. Michael Berry, “Survey of Text Mining: Clustering- Classification- and Retrieval”- Springer, 2004
2. Sholom Weiss, “Text Mining: Predictive Methods for Analyzing Unstructured Information”, Springer, 2005
3. Hercules Antonio do Prado, Edilson Fernada, “ Emerging Technologies of Text Mining: Techniques and Applications”, Information Science Reference (IGI), 2008
4. Min Song, Yi-fang Brrok Wu, “Handbook of Research on Text and Web Mining Technologies”, Vol I & II, Information Science Reference (IGI),2009

IF8012 X – INFORMATICS L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about medical informatics and healthcare informatics.
- To understand the case study of computerized patient record.
- To study and use different tools for clinical information system.
- To apply the knowledge of Bio informatics for systems.

UNIT I MEDICAL INFORMATICS 9

Introduction - Structure of Medical Informatics –Internet and Medicine -Security Issues Computer based Medical Information Retrieval, Hospital Management and Information System - Functional Capabilities of a Computerized HIS - E-Health Services - Health Informatics – Medical Informatics – Bioinformatics.

UNIT II HEALTHCARE INFORMATICS 9

Strategic Planning - Selecting a Health Care Information System - Systems Integration and Maintenance - Systems Integration - Regulatory and Accreditation Issues - Contingency Planning and Disaster Recovery.

UNIT III COMPUTERISED PATIENT RECORD 9

Introduction - History taking by Computer, Dialogue with the Computer - Components and Functionality of CPR - Development Tools – Intranet - CPR in Radiology - Application Server Provider - Clinical Information System - Computerized Prescriptions for Patients.

UNIT IV MEDICAL IMAGING 9

Automated Clinical Laboratories - Automated Methods in Hematology - Cytology and Histology - Intelligent Laboratory Information System - Computerized ECG, EEG And EMG - Computer Assisted Medical Imaging - Nuclear Medicine - Ultrasound Imaging Ultrasonography -Computed X-Ray Tomography - Radiation Therapy and Planning, Nuclear Magnetic Resonance.

UNIT V BIO-INFORMATICS 9

Pair wise Sequence Alignment – Local Versus Global Alignment – Multiple Sequence Alignment – Computational Methods – Dot Matrix Analysis – Substitution Matrices – Dynamic Programming – Word Methods – Bayesian Methods – Multiple Sequence Alignment – Dynamic Programming – Progressive Strategies – Iterative Strategies – Tools – Nucleotide Pattern Matching – Polypeptide Pattern Matching – Utilities – Sequence Databases.

TOTAL:45 PERIODS

OUTCOMES:

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

- To design and develop clinical and hospital management system on his own.
- To work with different medical imaging techniques.
- To apply the knowledge of bio informatics for biological databases.

REFERENCES:

1. R.D.Lele, “Computers in Medicine Progress in Medical Informatics”, Tata Mcgraw Hill Publishing Computers, 2005.
2. Mohan Bansal, “Medical informatics”, Tata McGraw Hill Publishing, 2003.
3. Burke, Lillian; Well, Barbara, “Information Technology for the Health Professions”, Prentice Hall, 2006.
4. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.

IF8013 MACHINE LEARNING L T P C
3 0 0 3

OBJECTIVES:

- To understand the concepts of machine learning.
- To appreciate supervised and unsupervised learning and their applications.
- To understand the theoretical and practical aspects of Probabilistic Graphical Models.
- To appreciate the concepts and algorithms of reinforcement learning.
- To learn aspects of computational learning theory.

UNIT I INTRODUCTION **9**

Machine Learning - Machine Learning Foundations –Overview – Applications - Types of Machine Learning - Basic Concepts in Machine Learning - Examples of Machine Learning - Applications - Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison.

UNIT II SUPERVISED LEARNING **9**

Linear Models for Classification - Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression - Decision Trees - Classification Trees - Regression Trees – Pruning - Neural Networks - Feed-Forward Network Functions - Error Back-Propagation - Regularization - Mixture Density and Bayesian Neural Networks - Kernel Methods - Dual Representations - Radial Basis Function Networks - Ensemble methods - Bagging - Boosting.

UNIT III UNSUPERVISED LEARNING **9**

Clustering- K-means - EM - Mixtures of Gaussians - The EM Algorithm in General -Model Selection for Latent Variable Models - High-Dimensional Spaces -- The Curse of Dimensionality - Dimensionality Reduction - Factor Analysis - Principal Component Analysis - Probabilistic PCA- Independent Components Analysis.

UNIT IV PROBABILISTIC GRAPHICAL MODELS **9**

Directed Graphical Models - Bayesian Networks - Exploiting Independence Properties - From Distributions to Graphs - Examples - Markov Random Fields - Inference in Graphical Models - Learning –Naive Bayes Classifiers - Markov Models – Hidden Markov Models – Inference – Learning- Generalization – Undirected graphical models - Markov Random Fields- Conditional Independence Properties - Parameterization of MRFs - Examples - Learning - Conditional Random Fields (CRFs) - Structural SVMs.

UNIT V ADVANCED LEARNING **9**

Sampling – Basic sampling methods – Monte Carlo - Reinforcement Learning - K-Armed Bandit- Elements - Model-Based Learning - Value Iteration- Policy Iteration - Temporal Difference Learning- Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions- Eligibility Traces- Generalization- Partially Observable States- The Setting- Example - Semi-Supervised Learning - Computational Learning Theory - Mistake Bound Analysis - Sample Complexity Analysis - VC Dimension - Occam Learning - Accuracy and Confidence Boosting.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To implement a neural network for an application of your choice using an available tool.
- To implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results.
- To use a tool to implement typical clustering algorithms for different types of applications.
- To design and implement an HMM for a sequence model type of application
- To identify applications suitable for different types of machine learning with suitable justification.

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2006
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
3. Ethem Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India, 2005
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
5. Hastie, Tibshirani, Friedman, “The Elements of Statistical Learning” (2nd ed)., Springer, 2008
6. Stephen Marsland, “Machine Learning –An Algorithmic Perspective”, CRC Press, 2009

CP8075 SOCIAL NETWORK ANALYSIS L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about the current web development and emergence of Social Web.
- To study about the modeling, 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.

UNIT I INTRODUCTION TO SOCIAL NETWROK ANALYSIS 8

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

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 8

Ontology and their role in the Semantic Web - Ontology-based Knowledge Representation - Ontology languages 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 network data, Advanced Representations.

UNIT III EXTRACTION AND MINING COMMUNITITES IN WEB SOCIAL NETWORKS 10

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

UNIT IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES 10

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 Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons - Attack Spectrum and Countermeasures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 8

Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online 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:45 PERIODS

OUTCOMES:

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

- To apply knowledge for current web development in the era of Social Web.
- To model, aggregate and represent knowledge for Semantic Web.
- To design extraction and mining tools for Social networks.
- To develop personalized web sites and visualization for Social networks.

REFERENCES:

1. Peter Mika, “Social Networks and the Semantic Web”, Springer, 1st edition 2007.
2. Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, 1st edition, 2010.

3. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 1st edition, 2011.
4. Dion Goh and Schubert Foo, “Social information retrieval systems: emerging technologies and applications for searching the Web effectively”, IGI Global snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling”, IGI Global snippet, 2009.
6. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

IF8071 ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

OBJECTIVES:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To enable Problem-solving through various searching techniques.
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To apply AI techniques primarily for machine learning, vision, and robotics.

UNIT I INTRODUCTION 9

Introduction to Artificial Intelligence – Intelligent Agents – Agents and Environments - Good behavior – The Nature of Environments – Structure of Agents - Problem Solving - Problem Solving Agents – Agent Architectures and Hierarchical Control - Agents - Agent Systems – Hierarchical Control - Embedded and Simulated Agents - Acting with Reasoning.

UNIT II SEARCHING TECHNIQUES 9

Searching For Solutions – Uniformed Search Strategies - Avoiding Repeated States – Searching with Partial Information - Informed Search and Exploration – Informed Search Strategies – Heuristic Function – Local Search Algorithms and Optimistic Problems – Local Search in Continuous Spaces – Online Search Agents and Unknown Environments – Constraint Satisfaction Problems (CSP) – Backtracking Search and Local Search for CSPs – Structure of Problems - Adversarial Search – Games – Optimal Decisions in Games – Alpha-Beta Pruning – Imperfect Real-Time Decisions – Games that include an element of chance.

UNIT III KNOWLEDGE AND REASONING 9

Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining -Backward Chaining - Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming.

UNIT IV LEARNING 9

Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

UNIT V AI PLANNING AND APPLICATIONS 9

AI Planning – Planning with State - Space Search – Partial-Order Planning – Planning Graphs – Planning with Propositional Logic- Hierarchical Task Network Planning – Conditional Planning - AII applications – Language Models - Information Retrieval – Information Extraction - Machine Translation – Machine Learning - Symbol-Based – Machine Learning: Connectionist – Machine Learning - Social and Emergent -Robots

TOTAL: 45 PERIODS

OUTCOMES:

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

- Provides a basic exposition to the goals and methods of Artificial Intelligence.
- Study of the design of intelligent computational agents.
- The knowledge acquired through learning can be used both for problem solving and for reasoning
- Improves problem solving, reasoning, planning, natural language understanding, computer vision, automatic programming and machine learning.

REFERENCES:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education / Prentice Hall of India, 2010.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill, 2010.
3. Bratko I, “Prolog Programming for Artificial Intelligence”, Addison-Wesley Educational Publishers Inc; Fourth Edition, 2011.
4. David L. Poole, Alan K. Mackworth, “Artificial Intelligence: Foundations of Computational Agents”, Cambridge University Press, 2010.
5. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning series)”, The MIT Press; Second edition, 2009.
6. Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.
7. Dan W.Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI, 2006.
8. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.

IF8072 COMPILER DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To understand the optimization techniques used in compiler design.
- To be aware of the various computer architectures that support parallelism.
- To become familiar with the theoretical background needed for code optimization.
- To understand the techniques used for identifying parallelism in a sequential program.
- To learn the various optimization algorithms.

UNIT I INTRODUCTION 9

Language Processors - The Structure of a Compiler – The Evolution of Programming Languages- The Science of Building a Compiler – Applications of Compiler Technology Programming Language Basics - The Lexical Analyzer Generator -Parser Generator - Overview of Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Principle Sources of Optimization.

UNIT II INSTRUCTION-LEVEL PARALLELISM 9

Processor Architectures – Code-Scheduling Constraints – Basic-Block Scheduling –Global Code Scheduling – Software Pipelining.

UNIT III OPTIMIZING FOR PARALLELISM AND LOCALITY – THEORY 9

Basic Concepts – Matrix-Multiply: An Example - Iteration Spaces - Affine Array Indexes – Data Reuse Array data dependence Analysis.

UNIT IV OPTIMIZING FOR PARALLELISM AND LOCALITY- APPLICATION 9

Finding Synchronization - Free Parallelism – Synchronization Between Parallel Loops – Pipelining – Locality Optimizations – Other Uses of Affine Transforms.

UNIT V INTERPROCEDURAL ANALYSIS 9

Basic Concepts – Need for Interprocedural Analysis – A Logical Representation of Data Flow – A Simple Pointer-Analysis Algorithm – Context Insensitive Interprocedural Analysis - Context-Sensitive Pointer-Analysis - Datalog Implementation by Binary Decision Diagrams.

TOTAL:45 PERIODS

OUTCOMES:

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

- Design and implement techniques used for optimization by a compiler.
- Modify the existing data structures of an open source optimizing compiler.
- Design and implement new data structures and algorithms for code optimization.
- Critically analyze different data structures and algorithms used in the building of an optimizing compiler

REFERENCES:

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, “Compilers:Principles, Techniques and Tools”, Second Edition, Pearson Education,2008.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.

IF8073 COMPUTER VISION L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic concepts of camera calibration, stereoscopic imaging and higher level image processing operations.
- To familiarize the student with the image processing facilities in Matlab and its equivalent open source tools like Open CV.
- To appreciate the use of compute vision in Industrial applications and to understand the role of computer vision.
- To understand and implement more advanced topics in current research literature.

UNIT I FUNDAMENTALS OF VISION 9

Image formation - Camera models - Light and color - Linear filters and edges - Geometric vision - Camera calibration - Epipolar geometry - Measuring light, sources - shadows and shading.

UNIT II GEOMETRIC VISION 9

Linear filters - multiple views geometry – Stereopsis - Two-view and multi-view stereo Structure from motion – Recognition - Bags of features - Affine structure from motion.

UNIT III VISION ALGORITHMS 9

Segmentation - Edge detection - Optical flow and Tracking - Feature extraction (corners and blobs) - Grouping and fitting - Hough transform - RANSAC and Alignment

UNIT IV GEOMETRIC METHODS 9

Model based Vision - smooth surfaces and their outlines - Aspect graphs and Range data – Applications.

UNIT V HIGH LEVEL VISION 9

Classifiers – Finding templates - Geometric templates from spatial relations – Spatial Features – Classification - Applications.

TOTAL: 45 PERIODS

OUTCOMES:

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

– Implement basic computer vision algorithms.
– Familiar with the use of MATLAB and Open CV environment.
– Design and implement industrial applications that incorporate different concepts of medical Image Processing.
– Critically analyze different approaches to implement mini projects in industrial environment.

REFERENCES:

1. Richard Szeliski, “Computer Vision Algorithms and Applications Springer International”, 2011.
2. David Forsyth and Jean Ponce, “Computer Vision a Modern Approach”, Prentice Hall, 2009.
3. Oliver Faugeras, “Three-Dimensional Computer Vision-a geometric viewpoint”, The MIT Press, 1993.
4. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Richard Hartley and Andrew Zisserman,

IF8074 DATA WAREHOUSING AND DATA MINING L T P C
3 0 0 3

OBJECTIVES:

- To understand Data mining principles and techniques and introduce Data Mining as a cutting edge business intelligence.
- To expose the students to the concepts of Data Warehousing Architecture and Implementation.
- To study the overview of developing areas – Web mining, Text mining and ethical aspects of Data mining.
- To identify Business applications and Trends of Data mining.

UNIT I DATA WAREHOUSE 8

Data Warehousing - Operational Database Systems vs. Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP Operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

UNIT II DATA MINING & DATA PREPROCESSING 9

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT III ASSOCIATION RULE MINING 8

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

UNIT IV CLASSIFICATION & PREDICTION 10

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT V CLUSTERING 10

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Evolve Multidimensional Intelligent model from typical system.
- Discover the knowledge imbibed in the high dimensional system.
- Evaluate various mining techniques on complex data objects.

REFERENCES:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. A Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Pearson Education, 2007.

IF8075 DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of signals and systems.
- To analyze various frequency transforms and to determine their use to DSP.
- To design and analyze various digital filters.
- To give exposure on musical sound processing and image processing.

UNIT I SIGNALS AND SYSTEMS 9

Basic Elements of DSP – Concepts of Frequency in Analog and Digital Signals – Sampling Theorem – Discrete – Time Signals, Systems – Analysis of Discrete Time LTI Systems – Z Transform – Convolution (Linear And Circular) – Correlation.

UNIT II DISCRETE FOURIER TRANSFORMS 9

Introduction to DFT – Properties of DFT – Filtering Methods based on DFT – FFT Algorithms - Decimation in Time Algorithms, Decimation in Frequency Algorithms – Use of FFT in Linear Filtering.

UNIT III IIR FILTER DESIGN 9

Structures of IIR – Analog Filter Design – Discrete Time IIR Filter from Analog Filter – IIR Filter Design by Impulse Invariance, Bilinear Transformation, Approximation of Derivatives – (HPF, BPF, BRF) Filter Design using Frequency Translation.

UNIT IV FIR FILTER DESIGN 9

Structures of FIR – Linear Phase FIR Filter – Filter Design using Windowing Techniques, Frequency Sampling Techniques – Finite Word Length Effects in Digital Filters.

UNIT V SIGNAL PROCESSING 9

Multirate Signal Processing – Adaptive Filter – Compression - Musical Sound Processing – Image Enhancement

TOTAL : 45 PERIODS

OUTCOMES:

- Understand the basics of signals and systems.
- Analyze various frequency transforms and to determine their use to DSP.
- Design and analyze various digital filters.
- Exposure on signal processing like musical sound processing and image processing.

REFERENCES:

1. John G. Proakis & Dimitris G.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, Fourth edition, Pearson education / Prentice Hall, 2007.
2. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second edition, Pearson Education / Prentice Hall, 2002.
3. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”,Tata McGraw Hill, fourth Edition, 2010.

IF8076 EMBEDDED COMPUTING SYSTEM DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To understand the architecture of embedded processor, microcontroller and peripheral devices.
- To interface memory and peripherals with embedded systems.
- To study the embedded network environment.
- To understand challenges in Real time operating systems.
- To study, analyze and design applications on embedded systems.

UNIT I EMBEDDED PROCESSORS 9

Embedded Computers - Characteristics of Embedded Computing Applications - Challenges in Embedded Computing System Design - Embedded System Design Process- Formalism for System Design - Structural Description - Behavioural Description - ARM Processor - Intel ATOM Processor.

UNIT II EMBEDDED COMPUTING PLATFORM 9

CPU Bus Configuration - Memory Devices and Interfacing - Input/Output Devices and Interfacing - System Design - Development and Debugging – Emulator – Simulator - JTAG Design Example – Alarm Clock - Analysis and Optimization of Performance - Power and Program Size.

UNIT III EMBEDDED NETWORK ENIVIRONMENT 9

Distributed Embedded Architecture - Hardware And Software Architectures - Networks for Embedded Systems - I2C - CAN Bus - SHARC Link Supports – Ethernet – Myrinet – Internet - Network-based Design - Communication Analysis - System Performance Analysis - Hardware Platform Design - Allocation and Scheduling - Design Example - Elevator Controller.

UNIT IV REAL-TIME CHARACTERISTICS 9

Clock Driven Approach - Weighted Round Robin Approach - Priority Driven Approach - Dynamic versus Static Systems - Effective Release Times and Deadlines - Optimality of the Earliest Deadline First (EDF) Algorithm - Challenges in Validating Timing Constraints in Priority Driven Systems - Off-Line versus On-Line Scheduling.

UNIT V SYSTEM DESIGN TECHNIQUES 9

Design Methodologies - Requirement Analysis – Specification - System Analysis and Architecture Design - Quality Assurance - Design Examples - Telephone PBX - Ink jet printer - Personal Digital Assistants - Set-Top Boxes.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand different architectures of embedded processor, microcontroller and peripheral devices.
- Interface memory and peripherals with embedded systems.
- Familiar with embedded network environment.
- Understand challenges in Real time operating systems.
- Design and analyze applications on embedded systems.

REFERENCES:

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computing System Design”, Morgan Kaufman Publishers.
2. Jane.W.S. Liu, “Real-Time systems”, Pearson Education Asia.
3. C. M. Krishna and K. G. Shin, “Real-Time Systems” , McGraw-Hill, 1997
4. Frank Vahid and Tony Givargis, “Embedded System Design: A Unified Hardware/Software Introduction”, John Wiley & Sons.
5. Andrew N Sloss, D. Symes, C. Wright, ” Arm system developers guide”, Morgan Kauffman/ Elsevier, 2006.

IF8077 HUMAN COMPUTER INTERACTION L T P C

3 0 0 3

OBJECTIVES:

- To learn the principles and fundamentals of human computer interaction (HCI).
- To analyze HCI theories, as they relate to collaborative or social software.
- To establish target users, functional requirements, and interface requirements for a given computer application.
- To understand user interface design principles, and apply them to designing an interface.
- To learn user interface designs through usability inspection and user models.
- To know the applications of multimedia on HCI.

UNIT I DESIGN PROCESS 9

Humans – Information Process – Computer – Information Process – Differences and Similarities – 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 DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS 9

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 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 EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI 9

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 THEORIES 9

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:45 PERIODS

OUTCOMES:

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

- Interpret the contributions of human factors and technical constraints on human-computer interaction.
- Evaluate the role of current HCI theories in the design of software.
- Apply HCI techniques and methods to the design of software.
- Categorize and carefully differentiate various aspects of multimedia interfaces.
- Design and develop issues related to HCI for real application.

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, Third Edition, Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, “Research Methods in Human-Computer Interaction”, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, Fifth Edition, Addison-Wesley Publishing Co, 2009.

IF8078 **IMAGE PROCESSING** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basic concepts and algorithms of digital image processing.
- To familiarize the student with the image processing environments like Matlab and its equivalent open source Image processing environments.
- To expose the student to a broad range of image processing and issues and their applications, and to provide the student with practical experience using them.
- To appreciate the use of image processing in current technologies and to expose the students to real-world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction – Elements of Visual Perception, Steps in Image Processing Systems – Digital Imaging System - Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – Color Images and Models - Image Operations – Arithmetic, Logical, Statistical and Spatial Operations.

UNIT II IMAGE ENHANCEMENT AND RESTORATION 9

Spatial Domain - Gray Level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT, Smoothing and Sharpening filters – Homomorphic Filtering, Noise models, Constrained and Unconstrained Restoration Models.

UNIT III IMAGE SEGMENTATION AND IMAGE FEATURE ANALYSIS 9

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Features – Textures - Boundary representations and Descriptions- Component Labeling – Regional descriptors and Feature Selection Techniques.

UNIT IV MULTI RESOLUTION ANALYSIS AND MORPHOLOGICAL PROCESSING 9

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms - Fast Wavelet Transforms - Wavelet Packets - Image Morphology - Binary and Gray Level Morphology Operations – Erosion – Dilation - Opening and Closing Operations – Distance Transforms – Basic Morphological Operations.

UNIT V IMAGE PATTERN RECOGNITION AND CASE STUDIES 9

Statistical Classifiers – Clustering Algorithms – Hierarchical and Partitional clustering – Image classification and Recognition - Image Understanding – Case Studies in Biometrics - Video - Image Fusion – Steganography

TOTAL : 45 PERIODS

OUTCOMES:

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

- Implement basic image processing algorithms using MATLAB tools.
- Design an application that incorporates different concepts of Image Processing.
- Apply and explore new techniques in the areas of image enhancement- restoration-segmentation- compression-wavelet processing and image morphology.
- Critically analyze different approaches to implement mini projects
- Explore the possibility of applying Image processing concepts in various domains

REFERENCES:

1. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011, New Delhi.
2. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2008, New Delhi.
3. Alasdair McAndrew, “Introduction to Digital Image Processing with Matlab”, Cengage Learning 2011, India.
4. Anil J Jain, “Fundamentals of Digital Image Processing”, PHI, 2011.
5. Wilhelm Burger, Mark J Berge, “Digital Image Processing: An algorithmic Introduction using Java”, Springer International Edition, 2008.

IF8079 INFORMATION RETRIEVAL L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of Information Retrieval with pertinence to modeling, 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.

UNIT I INTRODUCTION 9

Introduction - Goals and History of IR - The Impact of the Web on IR - The Role of Artificial Intelligence (AI) in IR - Basic IR Models - Boolean and Vector-Space Retrieval Models - Ranked Retrieval - Text-Similarity Metrics - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Cosine Similarity.

UNIT II PREPROCESSING 9

Basic Tokenizing Indexing and Implementation of Vector-Space Retrieval - Simple Tokenizing - Stop-Word Removal and Stemming - Inverted Indices - Efficient Processing with Sparse Vectors - Query Operations and Languages - Relevance Feedback - Query Expansion - Query Languages.

UNIT III METRICS 9

Experimental Evaluation of IR - Performance Metrics – Recall - Precision and F Measure - Evaluations on Benchmark Text Collections - Text Representation - Word Statistics - Zipf's Law - Porter Stemmer – Morphology - Index Term Selection - Using Thesauri - Metadata and Markup Languages - Web Search - Search Engines – Spidering – Metacrawlers - Directed Spidering - Link Analysis Shopping Agents.

UNIT IV CATEGORIZATION AND CLUSTERING 9

Text Categorization and Clustering - Categorization Algorithms - Naive Bayes - Decision Trees and Nearest Neighbor - Clustering Algorithms - Agglomerative Clustering - K-Means - Expectation Maximization (EM) - Applications to Information Filtering – Organization and Relevance Feedback.

UNIT V EXTRACTION AND INTEGRATION 9

Recommender Systems - Collaborative Filtering and Content-Based Recommendation of Documents and Products Information Extraction and Integration - Extracting Data from Text – XML - Semantic Web - Collecting and Integrating Specialized Information on the Web.

TOTAL: 45 PERIODS

OUTCOMES:

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

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

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008
2. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition, 2011.
3. Brusilovsky, Peter, "The Adaptive Web: Methods and Strategies of Web Personalization", Springer, 2007

IF8080 SERVICE ORIENTED ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- To understand various architecture for application development.
- To learn the importance of SOA in application integration.
- To learn web service and SOA related tools.

UNIT I SOA BASICS 9

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – Perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for Enterprise Application – Software Platforms for Enterprise Applications – Patterns for SOA – SOA Programming Models

UNIT II SOA ANALYSIS AND DESIGN 9

Service-Oriented Analysis and Design – Design of Activity, Data, Client and business Process Services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – Stakeholder Objectives – Benefits of SPA – Cost Savings

UNIT III SOA GOVERNANCE 9

SOA Implementation and Governance – Strategy – SOA Development – SOA Governance – Trends in SOA – Event-Driven Architecture – Software as a Service – SOA Technologies – Proof-of-Concept – Process Orchestration – SOA Best Practices

UNIT IV SOA IMPLEMENTATION 9

SOA using REST – RESTful Services – RESTful Services with and without JWS – Role of WSDL, SOAP and Java/XML mapping in SOA – JAXB Data Binding.

UNIT V APPLICATION INTEGRATION 9

JAX –WS 2.0 Client side/Server side Development – Packaging and Deployment of SOA Component – SOA Shopper Case Study – WSDL Centric Java WS with SOA- J –Related Software – Current Trends.

TOTAL:45 PERIODS

OUTCOMES:

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

- Compare different IT architecture.
- Analyze and design SOA based applications.
- Implement web services and realization of SOA.
- Implement RESTful services.
- Design and implement SOA based application integration using BPEL.

REFERENCES:

1. Shankar Kambhampaly, “Service – Oriented Architecture for Enterprise Applications”, Wiley India Pvt Ltd, 2008.
2. Mark D. Hansen, “SOA using Java Web Services”, Practice Hall, 2007.

IF8081	SOFT COMPUTING	L T P C
		3 0 0 3

OBJECTIVES:

- To learn the key aspects of Soft computing and Neural networks.
- To study the fuzzy logic components.
- To gain insight onto Neuro Fuzzy modeling and control.
- To know about the components and building block hypothesis of Genetic algorithm.
- To gain knowledge in machine learning through Support Vector Machines.

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) – Applications of GA - Building block hypothesis-Representation – Fitness Measures – Genetic Operators-. GA based Machine Learning.

UNIT III NEURAL NETWORKS 9

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT V NEURO-FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case Studies.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To discuss on machine learning through Neural networks.
- Apply knowledge in developing a Fuzzy expert system.
- Able to model Neuro Fuzzy system for clustering and classification.
- Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer–Verlag Berlin Heidelberg, 2005.
3. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
5. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2007.
6. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
7. S.N.Sivanandam, S.N.Deepa, " Introduction to Genetic Algorithms", Springer, 2007.

IF8082 SOFTWARE QUALITY AND TESTING L T P C

3 0 0 3

OBJECTIVES:

- To introduce the basics and necessity of software testing.
- To introduce various testing techniques along with software production.
- To introduce the concepts of Software quality and its assurance.

UNIT I INTRODUCTION 9

Basics of Software Testing – Testing Principles – Goals – Testing Life Cycle– Phases of Testing– Test Plan(IEEE format) – Importance of Testing in Software Production Cycle.

UNIT II SOFTWARE TESTING METHODOLOGY 9

Software Test Plan–Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Case Design - Test Development - Test Coverage - Test Evaluation -Prepare for Next Spiral - Conduct System Test - Acceptance Test - Summarize Testing Results.

UNIT III EMERGING SPECIALIZED AREAS IN TESTING 9

Test Process Assessment – Test Automation Assessment - Test Automation Framework – Nonfunctional Testing – SOA Testing – Agile Testing – Testing Center of Excellence – Onsite/Offshore Model - Modern Software Testing Tools.

UNIT IV SOFTWARE QUALITY MODELS 9

Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

UNIT V QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS 9

Role of Statistical Methods in Software Quality – Transforming Requirements intoTest Cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA).

TOTAL: 45 PERIODS

OUTCOMES:

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

- To work with various software testing strategies.
- To design and develop software quality models and implement software quality assurance.

REFERENCES:

1. William E.Lewis, "Software Testing and Continuous Quality Improvement", Third edition, Auerbach Publications, 2011.
2. Kshirasagar Naik, Priyadarshi Tripathy, "Software Testing and Quality Assurance Theory and Practice", John Wiley & Sons publication, 2011.
3. Ron Patton, "Software testing", Second edition, Pearson Education, 2007
4. Elfriede Dustin, Jeff Rashka, John Paul, "Automated Software Testing: Introduction, Management and Performance", Addison-Wesley, 1999.

IF8083 UNIX INTERNALS L T P C
3 0 0 3

OBJECTIVES:

- To understand the design of the UNIX operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in UNIX.

UNIT I OVERVIEW 9

General Overview of the System: History – System structure – User perspective –Operating System Services – Assumptions about Hardware. Introduction to the Kernel Architecture of the UNIX Operating System – Introduction to System Concept - The Buffer Cache - Buffer headers – Structure of the Buffer Pool – Scenarios for Retrieval of a Buffer– Reading and Writing Disk Blocks – Advantages and Disadvantages of the Buffer Cache.

UNIT II FILE SUBSYSTEM 9

Internal Representation of Files: Inodes – Structure of a Regular File – Directories –Conversion of a Path Name to an Inode – Super Block – Inode Assignment to a New File – Allocation of Disk Blocks.

UNIT III SYSTEM CALLS FOR THE FILE SYSTEM 9

Open – Read – Write – File And Record Locking – Adjusting the Position of File I/O – lseek – close – File Creation – Creation of Special Files – Changing Directory – Root – Owner - Mode – stat And fstat – Pipes – dup – Mounting And Unmounting File Systems – link – unlink.

UNIT IV PROCESSES 9

Process States and Transitions – Layout of System Memory – The Context of a Process – Saving the Context of a Process – Manipulation of the Process Address Space – Sleep - Process Control - Process Creation – Signals – Process Termination – Awaiting Process Termination – Invoking other Programs – User Id of a Process – Changing the size of a Process – Shell – System Boot and the INIT Process– Process Scheduling.

UNIT V MEMORY MANAGEMENT AND I/O **9**

Memory Management Policies – Paging and Segmentation - Swapping – Demand Paging - The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers.

TOTAL: 45 PERIODS

OUTCOMES:

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

- To understand the design of the UNIX operating system.
- To become familiar with the various data structures used.
- To learn the various low-level algorithms used in UNIX.

REFERENCES:

1. Maurice J. Bach, "The Design of the Unix Operating System", First Edition, Pearson Education, 1999.
2. B. Goodheart, J. Cox, "The Magic Garden Explained", Prentice Hall of India,1986.
3. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., "The Design and Implementation of the 4.3 BSD Unix Operating System", Addison Wesley, 1998.

IF8084 ADHOC AND SENSOR NETWORKS **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basics of Ad-hoc & Sensor Networks.
- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

UNIT I ADHOC NETWORKS FUNDAMENTALS AND MAC PROTOCOLS **9**

Fundamentals of WLAN's – IEEE 802.11 Architecture - Self Configuration and Auto Configuration-Issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc Networks-TCP Protocol Overview - TCP And MANET's – Solutions For TCP over Ad-Hoc Networks

UNIT II ADHOC NETWORK ROUTING AND MANAGEMENT **9**

Routing in Ad-Hoc Networks- Introduction -Topology based versus Position based Approaches - Proactive, Reactive, Hybrid Routing Approach - Principles and issues – Location services - DREAM – Quorums based Location Service – Grid – Forwarding Strategies – Greedy Packet Forwarding – Restricted Directional Flooding- Hierarchical Routing- Other Routing Protocols.

UNIT III SENSOR NETWORK FUNDAMENTALS AND COMMUNICATION PROTOCOLS **9**

Introduction – Architecture - Single Node Architecture – Sensor Network Design Considerations – Energy Efficient Design Principles for WSN's – Protocols for WSN – Physical Layer - Transceiver Design Considerations – MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control Issues - Routing Protocols – Mobile Nodes and Mobile Robots - Data Centric & Contention Based Networking – Transport Protocols & QoS – Congestion Control Issues – Application Layer Support.

UNIT IV SENSOR NETWORK MANAGEMENT AND PROGRAMMING **9**

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time Synchronization - Localization and Positioning – Operating Systems and Sensor Network Programming – Sensor Network Simulators.

UNIT V ADHOC AND SENSOR NETWORK SECQURITY 9

Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based Anti-tamper Techniques – Water Marking techniques – Defense against Routing Attacks - Secure Ad-hoc Routing Protocols – Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols - SPINS

TOTAL: 45 PERIODS

OUTCOMES:

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

- To conversant with Ad-hoc and sensor networks, protocols and standards.
- To establish a Sensor network environment for different type of applications.

REFERENCES:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, “Ad-Hoc and Sensor Networks: Theory and Applications”, Second Edition, World Scientific Publishing, 2011.
2. Holger Karl, Andreas willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Inc .2005.
3. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2004.
4. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
5. Erdal Çayırcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009
6. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006

IF8253 GPU ARCHITECTURE AND PROGRAMMING L T P C

3 0 0 3

OBJECTIVES:

- To understand the architecture of GPUs in order to program them effectively.
- To program using GPU programming frameworks.
- To optimize multimedia applications to run on GPUs.

UNIT I GPU ARCHITECTURES 9

Parallel Processors – Classification – Performance – Multimedia SIMD Architectures. GPU – NVIDIA Case Study – GPU Computational Structures – ISA – Memory Structures.

UNIT II CUDA 9

Introduction – CUDA Program Structure – Device memories – Data Transfer – Kernel Functions - CUDA Threads – Thread Organization – Synchronization & Scalability – CUDA memories – Performance

UNIT III OPENCL BASICS 9

OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.

UNIT IV OPENCL CONCURRENCY & EXECUTION MODEL 9

OpenCL Synchronization – Kernels – Fences – Barriers – Queueing – Global Synchronization – Memory Consistency – Events – Host side memory model – Device Side memory Model.

UNIT V PERFORMANCE AND CASE STUDY **9**

CPU / GPU Interaction – Open CL on AMD – Memory Performance Consideration – Case Studies.

TOTAL:45 PERIODS

OUTCOMES:

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

- Design multimedia applications using GPUs.
- Write Programs for GPUs using CUDA / OpenCL.
- Optimize programs to run on massive parallel architectures.

REFERENCES:

1. David B. Kirk, Wen-mei W. Hwu, "Programming massively parallel processors",Morgan Kauffman, 2010.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, " Heterogeneous computing with OpenCL", Morgan Kauffman, 2012.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
4. Wen– mei W. Hwu, "GPU Computing Gems", Morgan Kaufmann / Elsevier, 2011.

IF8351 VIRTUALIZATION **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the concept of virtualization.
- To understand the various issues in virtualization.
- To familiarize themselves with the types of virtualization.
- To compare and analyze various virtual machines products.

UNIT I OVERVIEW OF VIRTUALIZATION **10**

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level
of Operating Virtualization – Application Virtualization-Virtualization Advantages - Virtual Machine Basics – Taxonomy of Virtual Machines - Process Virtual Machines - System Virtual Machines – Hypervisor - Key Concepts.

UNIT II SERVER CONSOLIDATION **8**

Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development –Selecting server Virtualization Platform.

UNIT III NETWORK VIRTUALIZATION **10**

Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design – WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization – DataPath Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsec L2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

UNIT IV VIRTUALIZING STORAGE 8

SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries.

UNIT V VIRTUAL MACHINES PRODUCTS 9

Xen Virtual machine monitors- Xen API – VMware – VMware products - VMware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server.

TOTAL:45 PERIODS

OUTCOMES:

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

- Create a virtual machine and to extend it to a virtual network.
- Discuss on various virtual machine products.
- Compile all types of virtualization techniques and utilize them in design of virtual machines.

REFERENCES:

1. William von Hagen, “Professional Xen Virtualization”, Wrox Publications, January, 2008.
2. Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, A Press 2005.
3. Kumar Reddy, Victor Moreno, “Network virtualization”, Cisco Press, July, 2006.
4. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
5. David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.

MG8071 OPERATIONS RESEARCH L T P C

3 1 0 4

OBJECTIVES:

This course aims at providing the necessary basic concepts of a few deterministic optimization techniques, queueing theory, simulation and apply them to various engineering problems.

UNIT I QUEUEING MODELS (9+3)

Markovian Queues - Steady state analysis of Single and Multi-server Models - Little’s Formula - Finite and Infinite Capacity Models - Machine Interference Model - Self-Service Queue.

UNIT II LINEAR PROGRAMMING (9+3)

Formulation - Graphical Solution - Simplex Method - Two-Phase Method - Transportation and Assignment Models.

UNIT III NON-LINEAR PROGRAMMING (9+3)

Constrained Problems - Equality Constraints - Lagrangean Method - Inequality Constraints - Karush – Kuhn -Tucker (KKT) Conditions - Quadratic Programming.

UNIT IV DYNAMIC PROGRAMMING (9+3)

Dynamic Programming - Principle of Optimality - Forward and Backward Recursion – Applications of Dynamic Programming - Problem of Dimensionality.

UNIT V SIMULATION MODELLING (9+3)

Monte Carlo Simulation - Types of Simulation - Elements of Discrete Event Simulation - Generation of Random Numbers - Applications to Queuing systems.

L: 45 +T: 15 TOTAL:60 PERIODS

OUTCOMES:

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

- Have a clear perception of the power of mathematical programming tools and acquire skills to analyze queueing models.
- Demonstrate the application of the operations research techniques to problems drawn from industry, management and other engineering fields.

REFERENCES:

1. Taha H.A, "Operations Research: An Introduction", Pearson Education, New Delhi, Ninth Edition, 2010.
2. Gupta P.K. and Hira, D.S., "Operations Research", S.Chand & Company Ltd., Revised Edition, 2012.
3. Ravindran A., Don T. Phillips and James J. Solberg, "Operations Research", Wiley-India Edition, Second Edition, 2006.
4. Sharma J. K., "Operations Research", Macmillan Publishers India Ltd., Third Edition, 2009.

MM8071 DIGITAL VIDEO PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- To provide an introduction to the fundamental principles and techniques in multimedia signal processing.
- To provide an overview of the current multimedia standards and technologies.
- To provide details about representation and computing algorithms of multimedia.
- To review latest trends and future technologies.

UNIT I FUNDAMENTALS OF VIDEO PROCESSING 9

Video Formation, Perception and Representation - Video Capture and Display – Principles of Color Video - Video Cameras – Video Display and Composite versus Component Models and Gamma Correction – Analog Video Raster – Progressive vs Interlaced scans – Characterization of Video Raster – Spatial and Temporal resolution – Signal Bandwidth.

UNIT II DIGITAL VIDEO 9

Multiplexing of Luminance – Chrominance and Audio – Digital Video – Notation – ITU– R.BT.601 Digital Video Format and Other Digital Video Formats and Applications - Digital Video Quality - Video Sampling – Basics of the Lattice Theory – Sampling of Video Signals over Lattices – Filtering Operations in Cameras and Display Devices – Camera Apertures – Display apertures.

UNIT III VIDEO SEGMENTATION AND VIDEO FEATURE ANALYSIS 9

Video Modeling – Camera Models – Pinhole Model – Object Model – Shape Model, Motion Model – Scene Model - Two Dimensional Motion Models – Definition and Notation - Two Dimensional Motion Models Corresponding to Typical Camera Motions – Two Dimensional Motion Corresponding to Three Dimensional Rigid Motion and Approximation of Projective Mapping.

UNIT IV MOTION ESTIMATION 9

Two Dimensional Motion Estimation – Optical Flow – Two Dimensional Motion versus Optical Flow - Optical Flow Equation and Ambiguity in Motion Estimation - General Methodologies – Motion Representation - Motion Estimation Criteria – Optimization Methods - Pixel Based Motion Estimation - Regularization Using the Motion Smoothness Constraints – Block Matching Algorithm – Exhaustive Block Matching Algorithm – Phase Correlation Method and ultiresolution Motion Estimation – General Formulation and Hierarchical Block Matching Algorithm.

UNIT V DIGITAL VIDEO ANALYSIS AND CASE STUDIES 9

Digital video analysis – Basic Algorithms – Object Tracking and analysis – Video classification and Recognition– Video Understanding – Case Studies in Object tracking.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Implement basic algorithms related to digital video.
- Familiarize with the MATLAB and its equivalent open source tools for processing video.
- Design and implement some basic video related applications in domains like biometrics, object traction and in Industrial environment.
- Critically analyze the role of video in modern technologies.

REFERENCES:

1. Murat Teal, "Digital Video Processing", Pearson Education, 2010.
2. Alan Bovik C, “The Essential Guide to Video Processing”, Academic Press Inc, 2009.
3. David Bull et al, "Video Coding for Mobile Communications", Academic Press, 2008.
4. Oge Marques, “Practical Image and Video processing using Matlab”, IEEE Press, 2011.

MM8252 VIDEO ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To learn various techniques for mining data streams.
- To acquire the knowledge of extracting information from surveillance videos.
- To learn Event Modeling for different applications.
- To understand the models used for recognition of objects in videos.

UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS 9

Introduction to Big Data Platform – Challenges of Conventional systems – Web data- Evolution of Analytic scalability- analytic processes and tools- Analysis Vs Reporting- Modern data analytic tools- Data Analysis: Regression Modeling- Bayesian Modeling- Rule induction.

UNIT II MINING DATA STREAMS 9

Introduction to Stream concepts- Stream data model and architecture – Stream Computing- Sampling data in a Stream- Filtering Streams- Counting distinct elements in a Stream- Estimating moments- Counting oneness in a window- Decaying window- Real time Analytics platform(RTAP) applications- case studies.

UNIT III VIDEO ANALYTICS 9

Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- Object Detection and Tracking: Adaptive Background Modelling and Subtraction- Pedestrian Detection and Tracking-Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces

UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION 9

Event Modelling - Behavioural Analysis- Human Activity Recognition-Complex Activity Recognition- Activity Modelling using 3D shape, Video summarization, shape based activity models- Suspicious Activity Detection

UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS 9

Introduction - Overview of Recognition algorithms – Human Recognition using Face - Face Recognition from still images - Face Recognition from video - Evaluation of Face Recognition Technologies - Human Recognition using gait - HMM Framework for Gait Recognition - View Invariant Gait Recognition - Role of Shape and Dynamics in Gait Recognition.

TOTAL:45 PERIODS

OUTCOMES:

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

1. Work with big data platform and its analysis techniques.
2. Design efficient algorithms for mining the data from large volumes.
3. Work with surveillance videos for analytics.
4. Design of optimization algorithms for better analysis and recognition of objects in a scene.
5. Model a framework for Human Activity Recognition

REFERENCES:

1. Michael Berthold, David J.Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.
4. Rama Chellappa, Amit K.Roy-Chowdhury, Kevin Zhou.S, “Recognition of Humans and their Activities using Video”, Morgan&Claypool Publishers, 2005.