KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE -641049
(Autonomous Institution affiliated to Anna University)
REGULATION 2014
M.E. COMPUTER SCIENCE AND ENGINEERING
CURRICULUM AND SYLLABI

SEMESTER – I

Code No	Course Title	L	T	P	C
Theory					
P14MAT109	Advanced Computational Mathematics	3	1	0	4
P14CST101	Advanced Data Structures and Algorithms	3	0	0	3
P14CST102	High Performance Computer Architecture	3	0	0	3
P14CST103	Software Engineering Methodologies	3	0	2	4
P14CST104	Advanced Database Technologies	3	0	2	4
Practical					
P14CSP101	Advanced Data structures lab	0	0	3	1

Hours: 23 Credits: 19

SEMESTER – II

Code No	Course Title	L	T	P	C
Theory					
P14CST201	Data Warehousing and Data Mining	3	0	2	4
P14CST202	Distributed Computing	3	0	0	3
P14CST203	Network Engineering and Management	3	0	0	3
	Elective I	3	0	0	3
	Elective II	3	0	0	3
	Elective III	3	0	0	3
Practical					
P14CSP201	Mini Project	0	0	6	2

Hours: 26 Credits: 21

SEMESTER – III

Code No	Course Title	L	T	P	C
Theory					
	Elective IV	3	0	0	3
	Elective V	3	0	0	3
	Elective VI	3	0	0	3
	Elective VII (Self Study / Certification Course)	3	0	0	3
P14CSP301	Project Phase 1	0	0	12	3

Hours: 24 Credits: 15

SEMESTER – IV

Code No	Course Title	L	T	P	C
P14CSP401	Project Work	0	0	24	12

Hours: 24 Credits: 12

Total Hours: 97 Total Credits: 67

LIST OF ELECTIVES

SEMESTER – II

ELECTIVE-I

Code No.	Course Title	L	T	P	C
Theory					
P14MATE11	Stochastic Models and Simulation	3	0	0	3
P14MATE12	Graph Theory	3	0	0	3
P14MATE13	Fuzzy Sets and Rough Sets	3	0	0	3

ELECTIVE-II

Code No	Course Title	L	T	P	C
Theory					
P14CSTE21	Cryptography and Wireless Security	3	0	0	3
P14CSTE22	Business Intelligence	3	0	0	3
P14CSTE23	Grid and Cloud Computing	3	0	0	3

ELECTIVE-III

Code No	Course Title	L	T	P	C
Theory					
P14CSTE31	Service Oriented Architecture	3	0	0	3
P14CSTE32	Mobile And Pervasive Computing	3	0	0	3
P14CSTE33	Robotics and Computer Vision	3	0	0	3

SEMESTER – III

ELECTIVE-IV

Code No	Course Title	L	T	P	C
Theory					
P14CSTE41	Neural Networks and Fuzzy Systems	3	0	0	3
P14CSTE42	Adhoc and Sensor Networks	3	0	0	3
P14CSTE43	Fault Tolerant Computing System	3	0	0	3
P14CSTE44	Content Based Information Retrieval	3	0	0	3

ELECTIVE –V

Code No	Course Title	L	T	P	C
Theory					
P14CSTE51	Multi Agent Systems	3	0	0	3
P14CSTE52	Swarm Intelligence	3	0	0	3
P14CSTE53	Performance Evaluation of Computer Networks	3	0	0	3
P14CSTE54	Web Data Mining	3	0	0	3

ELECTIVE –VI

Code No	Course Title	L	T	P	C
Theory					
P14CSTE61	Forensic Computing And Reverse Engineering	3	0	0	3
P14CSTE62	Speech Technology	3	0	0	3
P14CSTE63	Embedded system Design	3	0	0	3
P14CSTE64	Information Retrieval Techniques	3	0	0	3

P14MAT109 ADVANCED COMPUTATIONAL MATHEMATICS 3 1 0 4

Course Objectives

- To solve the system of partial differential equations and its application.
- To deal with extreme values of functional.
- To know the concept of Eigen values and eigenvectors.
- To know the concept of numerical methods for solving PDE
- To know about finite element methods for solving boundary value problems.

Partial Differential Equations **(9)**

Classification of second order partial differential equations. Its characteristics and reduction to canonical forms. Solution of second order p.d.e. with variable coefficients by Monge's method. Boundary value problems. Laplace's equation in Cartesian and polar coordinate systems.

Calculus of Variations **(9)**

Euler's equation – Functionals dependent on first and higher order derivatives – Functionals dependent on functions of several dependent variables – Some applications – Direct method : Ritz method.

Eigen Values and Eigen Vectors Of Matrices **(9)**

Concept of eigen values and eigen vectors. The power method. The Rayleigh quotient. Inverse iteration. Jacobi's methods, Given and Householder's methods. Faddeev-Leverrier method. Sylvester's expansion theorem and computation of f(A) .

Numerical Methods **(9)**

Solution of Laplace and Poisson equation on a rectangular region by Leibmann's method – Diffusion equation by the explicit and Crank Nicolson implicit methods – Solution of wave equation by explicit scheme.

Introduction to Finite Element Method **(9)**

Concepts of finite element methods, nodes, elements – Galerkin's method – solution of boundary value problems by Ritz FEM and Galerkin FEM.

L: 45 Hours **T: 15 Hours** **Total: 60 Hours**

Reference Books

1. Sankara Rao K., "Introduction to Partial Differential Equations", Prentice Hall of India, 2nd Edition 2003.
2. Sastry, S.S, " Introductory Methods of Numerical Analysis", Third Edition, Prentice – Hall of India Pvt Ltd, New Delhi, 2003.
3. Kreyszig E., "Advanced Engineering Mathematics", John Wiley and Sons (Asia) Ltd., Singapore, 8th Edition, 2001.
4. Elsgolts L., "Differential equations and Calculus of variations", University Press of Pacific, 2006.
5. Grewal. B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition.
6. U.S.Dixit, " Finite element methods for engineers", Cengage Learning,1st Edition 2009.
   D.Cook, S. Malkus, E. Pheston, " Concepts and application of finite element analysis".4th Edition.

Course Outcomes

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

- Explain the theory and application of various probability and stochastic models [K2]
- Construct the sample space and to develop random variables and their moments.[K3]
- Apply different distributions in different situations and develop two dimensional random variables and their probability functions[K3]
- Utilize the Markovian models in the software reliability [K3]
- Make use of poisson process and renewal theory in during the study about service time [K3].
- Make use of the queuing models in the network analysis and to simulate the random variables.[K3]

P14CST101 ADVANCED DATA STRUCTURES AND ALGORITHMS 3 0 0 3

Course Objectives

- To introduce techniques for analyzing the efficiency of computer algorithms.
- To provide knowledge in various advanced data structures and algorithms.
- To introduce various algorithm design methods.

(9)

The Role of Algorithms in Computing-Getting Started-Growth of Functions –Divide-and-Conquer-The maximum-subarray problem-Strassen's algorithm for matrix multiplication-The Substitution Method for solving recurrences- The Recurrence Tree Method for solving recurrences –The Master Method for solving recurrences –Probabilistic Analysis and Randomized Algorithms-The Hiring Problem- Random Variables-Randomized Algorithms.

(9)

Min-max heaps – Deaps – Leftist heaps –Binomial heaps – Fibonacci heaps – Skew heaps – Lazy-binomial heaps.

(9)

Optimal Binary search trees – AVL trees – 2-3 trees – 2-3-4 trees – Red-black trees – B-trees – splay trees – Tries.

(9)

Dynamic Programming – Matrix chain multiplication –Elements of Dynamic programming-Longest common sequences
Greedy Algorithms-Activity selection problem-Elements of Greedy Strategy-Huffman code.
String Matching – The naïve string-matching algorithm- The Robin-Karp algorithm – String matching with finite automata – The Knuth-Morris-Pratt algorithm.

(**9)**

NP-completeness-Polynomial time-Polynomial-time verification-NP-completeness and reducibility-NP-completeness proofs – NP-completeness problems. Approximation Algorithms-The vertex-cover problem-The traveling-salesman problem – The set-covering problem, Randomization and linear programming, the subset-sum problem

L: 45 Hours T: 0 Hour Total: 45 Hours

Reference Books

1 Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++, Second Edition, Universities Press, Hyderabad, 2008.

2 Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, Prentice Hall of India, New Delhi, 2009

3 E. Horowitz, S. Sahni and S. Rajasekaran, Fundamentals of Computer Algorithms, Second Edition, University Press, 2008.

Course Outcomes

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

- Show the ability to analyze algorithms. [K2]
- Explain a variety of advanced data structures and their implementations.[K2]
- Identify different algorithm design techniques to solve problems. [K3]
- Solve problems by implementing learned algorithm design techniques and data structures. [K3]
- Explain approximation algorithms and NP-completeness. [K2

P14CST102 HIGH PERFORMANCE COMPUTER ARCHITECTURE 3 0 0 3

Course Objectives

- To have an understanding of the fundamentals of computer design.
- To study different ways of implementing parallelism and the concept of pipelining.
- To study about cache and virtual memories and I/O devices.
- To learn about multiprocessor and thread-level parallelism concepts.

Fundamentals of Computer Design (9)

Introduction- Classes of Computers- Defining Computer Architecture- Trends in Technology- Dependability- Measuring, Reporting and Summarizing Performance Quantitative Principles of Computer Design.Instruction set Principles**:** Introduction – Classifying Instruction set Architectures- Memory Addressing- Type and Size of Operands- Operations in the Instruction set – Instructions for Control Flow- Encoding an Instruction set.

Instruction Level Parallelism and Its Exploitation (10)

Pipelining: Introduction- The Major Hurdle of Pipelining — Pipeline Hazards. Instruction Level Parallelism: Concepts and Challenges – Basic Compiler Techniques for Exposing ILP- Reducing Branch Costs with Prediction – Overcoming Data Hazards with Dynamic Scheduling- Hardware Based Speculation- Exploiting ILP using Multiple Issue and Static Scheduling- Exploiting ILP using Dynamic Scheduling, Multiple Issues and Speculation

Limits On ILP (8)

Limits on Instruction-Level Parallelism**:** Introduction- Studies of the Limitations of ILP- Limitations on ILP for Realizable processors- Crosscutting Issues**:** Hardware versus Software speculation- Multithreading**:** Using ILP Support to exploit Thread-Level Parallelism. Performance & Efficiency in Advance multiple issue processors.

Multiprocessors and Thread-Level Parallelism (9)

Introduction – Symmetric Shared-Memory Architectures- Performance of Symmetric Shared-Memory Multiprocessors- Distributed Shared Memory and Directory-Based Coherence- Synchronization: The Basics- Models of Memory consistency an Introduction- Crosscutting Issues.

Memory Hierarchy Design and Storage System (9)

Memory Hierarchy Design**:** Introduction- Eleven Advanced Optimizations of Cache Performance – Memory Technology and Optimizations- Protection: Virtual Memory and Virtual Machines. Storage Systems**:** Introduction- Advanced Topics in Disk Storage- Definition and Examples of Real Faults and Failures-I/O Performance, Reliability Measures and Benchmarks

L: 45 Hours T: 0 Hour Total: 45 Hours

Reference Books

1 John L. Hennessey and David A. Patterson," Computer Architecture: A Quantitative Approach", Fourth Edition, Morgan Kaufmann, 2007.

2 D. Sima, T. Fountain and P. Kacsuk, " Advanced Computer Architectures: A Design Spac Approach", Addison Wesley, 2000.

3 Kai Hwang "Advanced computer architecture Parallelism Scalability Programmability", Tata McGraw Hill, 2001.

4 Vincent P.Heuring and Harry F.Jordan, "Computer System Design and Architecture", AddisonWesley, 2nd edition, 2004.

Course Outcomes

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

- Summarize the performance of a computer and compare it with a benchmark [K2]
- Explain the different compiler techniques for exposing ILP [K5]
- Compile the limitations on ILP for realizable processors [K6]
- Analyze the performance of symmetric shared-memory multiprocessors [K4]
- List the various optimization methods of enhancing the cache performance [K4]

P14CST103 SOFTWARE ENGINEERING METHODOLOGIES 3 0 2 4

Course Objectives

- To get an overview of role of Software in Computer-based systems and its characteristics.
- To understand the software development process and how they are organized into various life cycle models.
- To understand on quality control and how to ensure good quality software.
- To understand various steps in software development process such as requirements engineering, system models and software design.
- To understand the different types of maintenance activities needed to keep the software satisfying client needs over its life time.

Introduction to Software Engineering **(9)**

Expanding roles for computers, the place of Software, Software Engineering Discipline, Computer Based Systems, Increasing size and scope of software, Generic vs. Custom-made software products-distinctive characteristics of software products.

Software Development Models: Life cycle, Development process, Life cycle models-Linear Sequential, Evolutionary, Unified models, Agile development approach

Requirements Engineering **(9)**

Classification of Requirements-System Requirements and Software Requirements, Functional and Non-Functional requirements, Priority Categories of Requirements. Requirement Engineering Tasks – Elicitation, Analysis, Specification, Validation and Management.

System Models: Domain Analysis and Modeling, Data Models, Functional Models-structured Analysis Model, Object Oriented Models- Cloud, State, Use Case Models, Sequence and activity diagrams, Relationship among the Object Oriented Models, Building Object Oriented Analysis Models

Software Design and Implementation **(9)**

Architectural Design-Decomposition strategy, Partitions and Layers, Structured System Design-Use of Heuristics for Design Refinements, Object-Oriented Design-Handling Concurrency, Management of Global Resources. Detailed Design, User Interface Design-Human Factors, Evolution in HCI styles, HCI Design Issues, User Interface Standards and Guidelines, Evolution of User Interface Design through Prototypes. Reusable Components, Patterns, Frame works, Coding – Choice of Programming Language, Coding Standards

Software Testing **(9)**

Conventional Testing and SDLC Testing, Organization for Testing, Non-Execution-Based Testing-Formal Technical Reviews, Walkthroughs, Inspections, Use of Static Analyzers. Execution-Based Testing- Black-Box vs. Glass-Box Testing, Testing during Code Integration, Product Testing System Testing, Testing Distributed Implementation, Testing of Real-Time systems, Acceptance Testing.

Software Quality Management: Quality Dimensions, Process Quality and Product Quality, Quality Assurance Planning, Quality Measurements, Software Configuration Management-Version management, Software Process Improvement-Capability Maturity Model, Other SPI models

Software Project Management **(9)**

Software Projects, Project Feasibility Study, Project Planning, Project Organization, Estimation of Project Effort-Measuring Software Attributes and Productivity, COCOMO for Effort Estimation. Risk Management-Risk Identification, Risk Monitoring and Mitigation. Project Scheduling, Project Monitoring and Control-Assessment of Project Progress, Measurement during Software Projects.

Software Maintenance: Planning for Maintenance, maintenance Activities, Reengineering.

Component Lab

1. Practicing the different types of CASE tools such as (Rational Suite & other Open Source) used for all the phases of Software Development Life Cycle.
2. Data Modeling
3. Source Code Generators
4. Re-engineering
5. Implementation of the following using CASE Workbenches.
    a) Analysis and Design
    b) User-Interface Development
    c) Programming
    d) Verification and Validation
    e) Maintenance and Reverse Engineering
    f) Configuration Management

L: 45 Hours **Component Lab: 15 Hours** **Total: 60 Hours**

Reference Books

1 S. Thangasamy, "Essentials of Software Engineering", WileyIndia, First Edition, 2012

2 R.S. Pressman, 'Software Engineering – A Practitioner's Approach', Seventh edition, McGraw Hill International Edition, 2010.

3 Stephen Schach, 'Software Engineering', Seventh edition, TMH, New Delhi, 2007

4 Pankaj Jalote, 'An Integrated Approach to Software Engineering', Third edition, Narosa Publishing House, 2005

5 M. Blaha and J. Rumbaugh, 'Object Oriented Modeling and Design with UML', Second edition, Prentice-Hall India, 2006.

6 I Sommerville, 'Software Engineering', Seventh edition, Pearson Education, 2004

Course Outcomes

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

- Develop knowledge in computer science principles and engineering principles to design, develop, and verify software system. [K3]
- Translate end-user requirements into system requirements. [K2]
- Outline the difference between critical and non-critical systems. [K2]
- Apply software project planning and management. [K3]
- Compare various software development life cycle models. [K2]

P14CST104 ADVANCED DATABASE TECHNOLOGIES 3 0 2 4

Course Objectives

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram
- To make a study of SQL and relational database design.
- To have a knowledge about distributed DB- OO DB
- To know concepts of transaction processing- concurrency control techniques and recovery procedure in Distributed database.

Databases and Database Users **(9)**

Introduction – Characteristics of the Database Approach-Database Users and Administrator-Advantages of DBMS –Database Applications.

Database System Concepts and Architecture: Data Models-Three Schema Architecture and Data Independence-Database Languages and Interfaces- Database System Environment.

Data Modeling Using the Entity-Relationship(ER) Model **(10)**

High-Level Conceptual Data Model For Database Design-Entity Types, Entity Sets, Attributes and Keys-Relationship Types, Relationship Sets, Roles and Structural Constraints-Weak Entity Types

The Relational Data Model: Relational Model Concepts- Relational Model Constraints and Relational Database Schemas –Relational Algebra.

SQL: Schema Definition-Constraints and Views

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas-Functional Dependencies-Normal Forms Based On Primary Keys- First, Second, Third and Boyce Codd Normal Form

Distributed DBMSs Concepts and Design **(8)**

Introduction- Functions and Architecture of DDBMS- Distributed Relational Database Design- Transparencies in a DDBMS- Date's twelve Rules for DDBMS.

Distributed DBMSS Advanced Concepts **(9)**

Distributed Transaction Management-Distributed Concurrency Control- Distributed Deadlock Management- Distributed Database Recovery- The X/Open Distributed Transaction Processing Model - Distributed Query- Optimization- Replication and Mobile Databases

Introduction to Object DBMSS **(9)**

Advanced Database Applications- Weakness of RDBMS-Storing Object in Relational Databases-Next-Generation Database Systems-Object-Oriented Design.

Object-Oriented DBMSs- Concepts and Design: Introduction to Object Oriented Data Models and OODBMSs- OODBMS Perspectives- Persistence- Issues in OODBMS-Advantages and Disadvantages.

Component Lab

List of Experiments

1. DDL and DML Commands
2. Transaction Control Commands And Aggregate Functions
3. Join and Nested Queries
4. Constraints and Views
5. Database Design and Implementation (Mini Project with Front End Tool)

L: 45 Hours **Component Lab: 15 Hours** **Total: 60 Hours**

Reference Books

1 Ramesh Elmasri, Shamkant B,Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2011.

2 Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and management", Pearson Education, Fourth Edition, 2012.

3 Abraham Silberschatz, Henry Korth, and S. Sudarshan, 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, 2012

Course Outcomes

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

- Develop knowledge on database design and implementation concepts [K3]
- Outline the basic concepts of distributed database and object oriented database[K2]
- Compares the Relational database with object oriented Database [K2]
- Explain the importance of backup and recovery techniques in distributed database systems [K2].
- Develop Distribute Database system to handle the real world problem [K3]

P14CSP101 ADVANCED DATA STRUCTURES LAB 0 0 3 1

Course Objectives

- To analyze the time complexity of programs.
- To implement various advanced data structures.
- To develop programs using various algorithm design methods.
- To efficiently implement solutions for specific problems

List of Experiments

1 Implementation of any two of the following Heap structures

- Deaps (Insertion, Delete Min, Delete Max)
- Leftist Heap (All Meldable Priority Queue operations)
- Skew Heap (All Meldable Priority Queue operations)
- Fibonacci Heap (All Meldable Priority Queue operations)

2 Implementation of any two of the following Search Structures

- AVL Trees (Insertion, Deletion and Search)
- Splay Trees (Insertion, Deletion and Search)
- Tries for any specified alphabet (Insertion, Deletion and Search)
- B-Trees (Insertion, Deletion and Search)

3 Implementation of the following divide-and-conquer algorithms

- Convex-hull algorithm.
- Strassen's algorithm

4 Implementation of Huffman code

5 Implementation of any two of the following problems using approximation algorithm.

- Vertex cover problem
- Traveling salesman problem
- Set-Cover problem
- Subset-sum problem

Course Outcomes

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

- Develop skills to implement various advanced data structures. [K3]
- Develop skills to implement various algorithm design techniques. [K3]
- Develop skills to identify appropriate data structures and algorithm design techniques for solving problems. [K3]
- Utilize the acquired knowledge to think critically for improvement of the solution.[K3]
- Develop applications using various data structures and design techniques. [K3]

P14CST201 DATA WAREHOUSING AND DATA MINING 3 0 2 4

Course Objectives

- To evolve multidimensional intelligent model from a typical system
- To represent multi dimensional data for a data warehouse
- To Discover the knowledge imbibed in the high dimensional system
- To find the hidden interesting patterns in data
- To evaluate various mining techniques on complex data objects.

Introduction to Data Warehousing (8)

Evolution of Decision Support Systems- Data warehousing Components –Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations

Data Warehouse Process and Architecture (9)

Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends – Business Applications- tools-SAS.

Introduction to Data Mining (9)

Data mining-KDD versus data mining, Stages of the Data Mining Process-task primitives, Data Mining Techniques –Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns-association-correlation.

Classification and Clustering (10)

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Clustering techniques – , Partitioning methods- k-means Hierarchical Methods – distance based agglomerative and divisible clustering, Density-Based Methods – expectation maximization –Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis

Data Warehousing and Data Mining Software's and Applications (9)

Mining complex data objects, Spatial databases, temporal databases, Multimedia databases, Time series and Sequence data; Text Mining –Graph mining-web mining-Application and trends in data mining.

Component Lab

List of Experiments

1. Exercise on Data warehouse Design for an enterprise
2. Exercise on Classification Algorithms
3. Exercise on Clustering Algorithms
4. Exercise on Discovering Association Rules
5. Exercises on Data mining tools

L: 45 Hours Component Lab: 15 Hours Total: 60 Hours

Reference Books

1 Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques" , Morgan Kaufmann Publishers, third edition2011, ISBN: 1558604898.

2 Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", TataMc Graw Hill Edition, Tenth Reprint 2007.

3 G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.

4 Mehmed kantardzic,"Datamining concepts,models,methods, and lgorithms", Wiley Interscience, 2003.

5 Ian Witten, Eibe Frank, "Data Mining; Practical Machine Learning Tools and Techniques", third edition, Morgan Kaufmann, 2011.

6 George M Marakas, "Modern Data Warehousing, Mining and Visualization", Prentice Hall, 2003.

Course Outcomes

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

- Explain the concepts of Data Warehousing architecture and implementation[K2]
- Apply the association rules for real life mining applications[K3]
- Develop and deploy appropriate Classification/ Clustering techniques for various problems with high dimensional data[K3]
- Discover the knowledge imbibed in the high dimensional system[K4]
- Evaluate various data mining techniques on complex data objects[K5]

P14CST202 **DISTRIBUTED COMPUTING** **3 0 0 3**

Course Objectives

- To layout foundations of Distributed Systems.
- To introduce the idea of middleware and related issues.
- To understand the issues involves in studying data and design of distributed algorithms.
- To learn Hadoop distributed file system and remote object access methods.

Introduction **(9)**

Introduction to Distributed systems-examples of distributed systems- resource sharing and the web- challenges-architectural models- fundamental models – Introduction to inter-process communications-external data representation and marshalling- client server communication-group communication – Case study: IPC in UNIX

Distributed Objects and File System **(9)**

Introduction – Communication between distributed objects – Remote procedure call – Events and notifications – Java RMI case Study – Introduction to Distributed File System – File service architecture – Sun network file system – The Andrew File system – Introduction to Name Services- Name services and DNS – Directory services

Distributed Operating System Support **(10)**

The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging – Distributed mutual exclusion

Distributed Transactions, Replication and Multimedia Systems **(8)**

Introduction to distributed transactions - Flat and nested distributed transactions - Concurrency control in distributed transactions - Distributed deadlocks - Replication - System model and group communications – Fault tolerant services – Introduction to Distributed Multimedia systems – Characteristics of multimedia data-Quality of Service management

Distributed File System **(9)**

Hadoop Distributed File System architecture – Map reduce Features – a virtual machine Hadoop environment – running a sample program – Java RMI program execution – EJB in Distributed environment – introduction.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 George Coulouris, Jean Dollimore, Tim Kindberg, , "Distributed Systems: Concepts and Design", 4th Edition, Pearson Education, 2005.

2 A. S. Tanenbaum and M. V. Steen, "Distributed Systems: Principles and Paradigms", Second Edition, Prentice Hall, 2006.

3 Mukesh Singhal and N. G. Shivaratri, “Advanced Concepts in Operating Systems”, McGraw-Hill, 2001

4 EJB web references:

- Sun Application Server: http://www.sun.com/software/products/appsrvr/home_appsrvr.xml
- JBoss : http://www.jboss.org
- Open EJB : http://openejb.sourceforge.net
- IBM WebSphere :http://www.ibm.com/websphere
- BEA WebLogic :http://www.bea.com/products/weblogic/server

5 Hadoop web references

Course Outcomes

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

- Define and explain the distributed environment [K1]
- Demonstrate the access of remote objects for the service[K2]
- Organize processes in a distributed systems [K3]
- Define and explain the functionalities of Hadoop distributed File management system[K1]
- Explain EJB in distributed environment[K2]

P14CST203 NETWORK ENGINEERING AND MANAGEMENT 3 0 0 3

Course Objectives

- To provide knowledge about various types of networking, networks, network topologies.
- To understand various high speed and high performance networks.
- To understand the basics of Network Management

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 – Modern Applications

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

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

High Speed Networks **(9)**

Optical links – WDM systems – Optical Cross Connects – Optical paths and Networks – Principles of ATM Networks – B-ISDN/ATM REFERENCE BOOKSModel – ATM Header Structure – ATM Adaptation Layer – Management and Control – Service Categories and Traffic descriptors in ATM networks

Network Management **(9)**

ICMP the Forerunner – Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.

2 Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2007.

3 Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002

4 William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.

5 Mani Subramaniam, 'Network Management: Principles and Practices', Pearson Education, 2000

6 Kasera and Seth, 'ATM Networks: Concepts and Protocols', Tata McGraw Hill, 2002.

Course Outcomes

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

- Outline the various protocols and models in networks. [K2]
- Analyze the operations and features network protocols in providing QoS. [K4]
- Interpret the operation of high performance and high speed networks and explain how they support communications. [K2]
- Develop and analyze simple computer networks. [K3]
- Identify and solve network-engineering problem. [K3]

P14MATE11 STOCHASTIC MODELS AND SIMULATION 3 0 0 3

Course Objectives

- To provide an understanding of the theory and application of various probability and stochastic models.
- To construct the sample space and to develop random variables and their moments.
- To apply different distributions in different situations and develop two dimensional random variables and their probability functions
- To utilize the Markovian models in the software reliability.
- To use Poisson process and renewal theory in during the study about service time.
- To implement the queuing models in the network analysis and to simulate the random variables.

Introduction to Probability and Random Variables **(9)**

Sample space and events, Probability axiom, Conditional probability, Independent events, Bayes theorem, Simple problems, Random Variables, Distribution functions, continuous and discrete random variables, Moments, Moment Generating Functions

Standard Distributions **(9)**

Bernoulli, Binomial, Geometric, Poisson random variables, uniform, exponential, Properties of exponential distribution, convolution of exponential random variables, normal random variables, Joint Distribution: simulation samples for the above mentioned distributions.

Markov Chains **(9)**

Markov chains, Chapman – Kolmogorov equations, Classification of states, examples of Markov chains. Gamblers ruin problem, mean time spent in transient states, branching process.

Poisson Processes and Renewal Theory **(9)**

Poisson process, Inter arrival of waiting time distribution, Applications to reliability problems, Estimating software reliability- Renewal Theory - examples, distribution of the counting process N(t), alternating renewal process, Regenerative process, computing the renewal function, semi – Markov process, Computation of renewal function, Poisson process as a renewal process.

Queuing Theory and Simulation **(9)**

Single server exponential queuing system, Queue with finite capacity, Shoe shine shop, network of queues, open and closed systems. Methods of simulation of random variables – Inverse transformation method, Rejection method

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Sheldon M. Ross, "Introduction to Probability Models", Academic presses, 2005.

2 Karlin and H.M. Tailor, "A First Course in Stochastic Processes", Academic Press, 1975.

3 Sheldon M.Ross, "A First Course in Probability", Sixth Edition, Prentice Hall, New Jersey, 2002

Course Outcomes

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

- Construct probabilistic models for observed phenomena through distributions which play an important role in many engineering applications [K3].
- Construct Transition Probability Matrix and classify states of the Markov chain [K3].
- Test the reliability of the system and the software reliability [K6].
- Choose a class of models in which customers arrive in some random manner at a service facility [K3].
- Illustrate Simulate the random variable [K2].

P14MATE12 **GRAPH THEORY** **3 0 0 3**

Course Objectives

- To gain knowledge in the basic concepts of graph, walk path, cycle and trees.
- To expertise with the analysis of finding matching and colouring of the graph.
- To gain knowledge in the concepts of planner and non-planer graph.
- To be able to find the maximal flow network and minimal spanning tree.
- To acquire knowledge in the concepts of Combinatorics.

Introduction **(9)**

Graph Theory: Basic concepts, Graph isomorphism, Subgraph, Degree, Walk, Path, Cycle,Trees, Spanning trees.

Connectivity and Colouring **(9)**

Cut vertices and cut edges, Connectivity, Euler tours and Hamiltonian cycles. Matching, Perfect matching, Colour of a graph,Vertex colouring, Chromatic polynomial edge colouring.

Planar Graphs **(9)**

Planar and non-planar graphs, Euler's formula, Kuratowski's theorem. Test and planarity, four colour theorem.

Directed Graphs and Flow **(9)**

Directed graphs, Tournaments, Network, Max Flow, Min cut theorem, Graphs and vector space. Graph enumeration. Polya's counting theorem, Graph algorithms. Shortest path, Minimal spanning tree, Fundamental circuit, Isomorphism.

Combinatorics **(9)**

Basic combinatorial numbers. Recurrence, generating functions. Multinomials, counting principles. Polya's theorem. Inclusion and exclusion principle. Block design and error Correcting codes. Hadamard matrix, Finite geometries.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Narsingh Deo, Graph Theory, Prentice Hall of India. Revised edition, 2004.

2 Harray F, Graph Theory Narosa Publishing House New Delhi

3 A first Course in Combinational Mathematics: I Anderson, Clarendon Press, Oxford, 1974

4 Algorithmic Graph Theory: Allan Gibbons, Cambridge Univ. press, 1985

Course Outcomes

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

- Compare graph, walk, path, cycle and trees [K2].
- Discover the perfect matching and chromatic polynomial of edge colouring [K4].
- Identify the planar and non planar graph [K3].
- Select the maximal flow network and minimal spanning tree of the given graph [K3].
- Construct recurrence relation, generating function and choose the counting principles [K3].

P14MATE13 **FUZZY SETS AND ROUGH SETS** **3 0 0 3**

Course Objectives

- To know the basic concepts of fuzzy set theory for effective solving of the uncertainty in problem.
- To understand the concept of fuzzy measure theory to explicate differences between fuzzy set theory and probability theory.
- To acquire the concept of fuzzy logic for solving the problem.
- To acquire the knowledge of fuzzy logic controller based on fuzzy logic.
- Help investigating the usage of rough sets.

Fuzzy Set **(9)**

Introduction: Basic concepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Fuzzy and Crisp relations – Fuzzy to Crisp conversion.

Fuzzy Measures **(9)**

Fuzzy measures possibility theory – possibility distributions – possibility and necessity measures – possibility and probability – Relationship among class of fuzzy measures.

Fuzzy Logic **(9)**

Fuzzy relational equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference – Predicate Logic – Inference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference – fuzzy rule based systems –fuzzification and defuzzification – types.

Advanced Fuzzy Logic Applications **(9)**

Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multiobjective decision making – fuzzy classification – means clustering.

Rough Sets **(9)**

Introduction, representation of Information**,** Information Relations Determined by Information Systems, Approximation spaces based on Information systems, Knowledge representation in rough set theory, Decision Tables, and Applications.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 H.J. Zimmerman, Fuzzy set theory and its Applications allied publishers Ltd (2000).

2 George Jkir and Tina A Folger: Fuzzy sets, uncertainity and Information PHI (2000).

3 Khir and Yuan: Fuzzy sets and Fuzzy logic – Theory and applications PHI (2000).

4 Rough Computing: Theories, Technologies,and Applications, Aboul Ella Hassanien, Zbigniew Suraj, Dominik Ślęzak, Pawan Lingras, Information science REFERENCE BOOKS(IGI Global), Hershey • New York

5 Rough Sets, Z. Pawlak, Kluwer Academic Publisher, 1991.

Course Outcomes

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

- Explain basic concepts of fuzzy set theory [K2].
- Explain fuzzy measures possibility theory and relationship among class of fuzzy measures [K2].
- Identify the fuzzification and defuzzification types [K3].
- Apply various industrial applications of FLC adaptive fuzzy systems [K3].
- Explain the representation in rough set theory, Decision Tables, and Applications [K2].

P14CSTE21 CRYPTOGRAPHY AND WIRELESS SECURITY 3 0 0 3

Course Objectives

- To brief about different cryptographic algorithms.
- To study various wireless security methods.
- To learn hardware perspectives and optimization of wireless security.

Cryptographic Security **(9)**

Ciphers – PRNG – DES – Attacks – SHA – AES - Key management - generation and distribution of keys - Public key distribution and Diffie Hellman - Discrete logarithm systems – ECC - Comparison of public key cryptographic systems - ECDLP and wireless devices - Key generation in wireless devices for IFP, DLP and ECDLP - Cryptography in embedded hardware: FPGA and ASICs.

WLAN, WAP, WTLS **(9)**

Wireless transmission media - WLAN products and standards - Securing WLANs – Countermeasures - WEP - Physical security - Comparison of TCP/IP, OSI and WAP models - WAP security architecture - Marginal security - Secure socket layer - Wireless transport layer security and WAP.

Bluetooth and VOIP **(9)**

Bluetooth basic specifications - development - Bluetooth security architecture - Scatternets - Security functions at the Baseband layer – Authentication – Encryption - Threats to Bluetooth security - VoIP standards - VoIP technology - Technical issues for VoIP calling - Voice network security vulnerabilities - Confidentiality, Integrity and Availability attributes -VoIP and the wireless security environment.

Hardware Perspectives for E2e in Wireless Applications **(9)**

Client-server vs Peer-to-peer land-based vs Wireless-based communications - Transmission medium (non-LAN point-to-point, LAN or WAN, or LAN-WAN-LAN) - Encryptor structures in wireless - Interception and vulnerability of wireless systems - Communications ESM and interception receivers - SAW technology - Direct Sequence Spread Spectrum system interception - Frequency hopping systems interception - Modulation recognition and Comint system output processing - Decision theoretical approach - Neural network based approach – Implications -Covert transmission.

Optimizing Wireless Security with Fpga and Asic **(9)**

Evaluating secure design architectures - Software vs. Hardware implementation of wireless security – On-chip modules - Basic architectures for block cipher crypto engines in a COMSEC chip - Security considerations for the modes during transmission - Protection against catalog attacks - Common techniques for implementing security modules - Embedded generation of random numbers – ECC based Diffie Hellman and Digital signatures - NTRU key generation.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Randall K.Nichols and Panos C.Lekkas, “Wireless Security Models, Threats and Solutions”, Tata McGraw Hill, 2006.

2 Behrouz A. Fourcuzan, ”Cryptography and Network Security”, Tata McGraw Hill, 2008.

3 William Stallings, “Cryptography and Network security: principles and practice", 2nd edn, Prentice Hall of India, New Delhi, 2002

4 Atul Kahate, “Cryptography and Network Security”, 2nd edn, Tata McGraw Hill, 2008
5 H.Yang et al., “Security in Mobile Ad Hoc Networks: Challenges and Solution”, IEEE Wireless Communications, Feb. 2004.

Course Outcomes

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

- Show how the public keys are distributed using Diffie Hellman method. [K2]
- Compare the performance of TCP/IP, OSI and WAP models [K4]
- Explain Bluetooth security architecture [K2]
- Discuss about interception and vulnerability of wireless systems [K6]
- Formulate common techniques for implementing security modules [K6]

P14CSTE22 **BUSINESS INTELLIGENCE** **3 0 0 3**

Course Objectives

- To provide enhanced knowledge on business Intelligence and the techniques for gathering, storing, analyzing, and Reporting.
- To impart knowledge about decision support system, online analytical processing (OLAP), statistical analysis, forecasting, and data mining.

Business Intelligence **(9)**

Introduction - Effective decision making – Use of Business Intelligence - The Source of Business Intelligence - The Unified Dimensional Model - Development of Business Intelligence.

Business Intelligence Structures **(9)**

Data Mart - Designing Data Mart - Table Compression - The Benefits of Integration - Integration services - Package items

Analyzing Cube Content **(9)**

Analysis Services – Measures – Dimensions - Features of OLAP Cubes - MDX Scripting - MDX Queries

Mining **(9)**

Introduction - Data Mining Algorithms - Data Mining Structure - Mining Model Viewer - Mining Accuracy Chart - Mining Model Prediction - Data mining Extensions.

Reporting **(9)**

Reporting Services - Report Service Architecture - Reports Creation - Report Manager - Managing Reports - Adhoc reporting.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Brain Larson, "Delivering Business Intelligence with Microsoft SQL server 2008", McGraw Hill, 2008, ISBN: 978-0071549448

2 Lynn Langit, "Foundations of SQL Server 2005 Business Intelligence", Apress 2007, ISBN 978- 1590598344

Course Outcomes

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

- Outline the source of Business Intelligence, use of Business Intelligence and development of Business Intelligence. [K2]
- Develop, initiate, and execute various types of projects for business intelligence.[K3]
- Apply the concepts of data mining techniques for clustering, association, and classification.[K3]
- Summarize reporting services and its architecture.[K2]
- Apply relevant theories, concepts and techniques to solve real-world BI problems [K3].

P14CSTE23 GRID AND CLOUD COMPUTING 3 0 0 3

Course Objectives

- To understand about grid systems, its services and job scheduling
- To learn about cloud services and virtual machines

Grid System Infrastructure **(9)**

Grid Architecture, Open grid services architecture (OGSA), The Globus Toolkit 3 (GT3), OGSA-DAI, WSRF, Semantic grid, Autonomic computing

Grid Basic Services **(8)**

Grid Security - Security Primer - Grid security infrastructure (GSI) - Authorization modes in GSI, Grid Monitoring – Architecture - Review criteria - Grid monitoring systems

Job Management and Scheduling **(9)**

Grid scheduling and resource management - Scheduling paradigms - scheduling with QoS - Review of Condor, Sun Grid Engine (SGE), Portable batch System (PBS), Load sharing facility (LSF)

Cloud Services **(9)**

Web based applications**,** Pros and Cons of cloud service development, Types of cloud services: Platform as a service- Infrastructure as a service -Software as a service, Discovering Cloud Services Development Services and Tools, Cloud maturity levels, CloudSim.

Virtual Machines **(10)**

Provisioning and manageability, Migration, Provisioning in the cloud context, Management of VM: Anatomy of cloud infrastructures-Scheduling techniques for advance reservation of capacity.

Monitoring and Management: Federated cloud computing, SLA management: Types – Lifecycle -Automated policy management in cloud

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Maozhen Li and Mark Baker, "The Grid: Core Technologies", Wiley, New Delhi, 2005.

2 Rajkumar Buyya ,James Broberg andAndrzej Goscinski, "Cloud Computing: Principles and Paradigms", John Wiley and Sons,2011.

3 Michael Miller, "Cloud Computing: Web-Based Applications That Change the WayYou Work and Collaborate Online", Que Publishing, 2008.

4 Joshy Joseph and Craig Fallenstein,"Grid Computing", Pearson Education, New Delhi, 2011.

5 Vladimir Silva, "Grid Computing for Developers", Dreamtech Press, New Delhi, 2006.

6 Anthony T.Velte, Toby J.Velte and Robert Elsenpeter, "Cloud Computing – A Practical Approach", Tata McGraw Hill, New Delhi, 2010.

7 Tom white, "Hadoop: The Definitive Guide", O'Reilly Media, 2012.

8 Judith Hurwitz, Robin Bloor, Marcia Kaufman and Dr. Fern Halper, "Cloud Computing for Dummies", Wiley Publishing, 2010

9 James Murty, "Programming Amazon Web Services: S3 EC2 SQS FPS and Simpledb", Shroff Publishers, Mumbai, 2008

10 Roger Jennings, "Cloud Computing with the Windows Azure Platform", Wiley India, New Delhi, 2010.

Course Outcomes

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

- Define and explain about grid computing [K1]
- Apply web services for grid applications [K3]
- Define and explain about cloud computing[K1]
- Summarize the cloud services and virtual machine concepts for different applications [K2]
- Utilize grid and cloud toolkits to solve real life problems [K3]

P14CSTE31 **SERVICE ORIENTED ARCHITECTURE** **3 0 0 3**

Course Objectives

- To understand the concepts of Service Oriented Architecture along with the evolution of SOA
- To aware of the key issues facing many organizations, especially dealing with integration among systems and providing architectural abstractions to them
- To integrate SOA technologies with Web Services paradigms.
- To know related technologies and implementation basics of SOA

The Evolution of SOA –Characteristics of SOA – Introducing SOA **(9)**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration – Choreography-addressing-Reliable messing-Correlation **(9)**

Policies-Meta data Exchange-Security- Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer-Agnostic Services-SOA delivery Strategies **(9)**

Service oriented analysis – Business-centric SOA – Deriving business services- service Modeling – Service modeling guide lines-Service Oriented Design – WSDL basics – SOAP basics –Service interface design tools– SOA composition guidelines – Entity-centric business service design – Application service design – Task centric business service design -Service design guidelines **(9)**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) - Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE) **(9)**

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Thomas Erl**, "**Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2011.

2 Thomas Erl, "SOA Principles of Service Design "The Prentice Hall Service-Oriented Computing Series from Thomas Erl, 2005

3 Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.

4 Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education, 2005.

5 Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILLY, First Edition, 2006.

Course Outcomes

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

- Demonstrate an understanding of architectural principles, architecture evolution processes, development methods with SOA, strengths and difficulties of service-oriented system development [K2]
- Organise the services to perform the service composition [K3]

- Model and design a service-oriented system using architectural principles, development methods with SOA and related technologies [K3]
- Evaluate and apply development methods of SOA [K5]
- Demonstrate ability to work in a software development team [A]

P14CSTE32 **MOBILE AND PERVASIVE COMPUTING** **3 0 0 3**

Course Objectives

- To study the emerging technologies in the context of wireless networks
- To understand the mobile computing environment
- To learn about pervasive computing environment

Wireless networks- emerging technologies- Blue tooth, WiFi, WiMAX, 3G ,WATM.-Mobile IP protocols -WAP push architecture-Wml scripts and applications. **(9)**

Mobile computing environment—functions-architecture-design considerations, content architecture -CC/PP exchange protocol, context manager. Data management in WAE-Coda file system- caching schemes- Mobility QOS. Security in mobile computing. **(8)**

Handoff in wireless mobile networks-REFERENCE BOOKSmodel-handoff schemes. Location management in cellular networks - Mobility models- location and tracking management schemes- time, movement, profile and distance based update strategies. ALI technologies **(8)**

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing- Pervasive devices- embedded controls.- smart sensors and actuators -Context communication and access services **(10)**

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services -Context aware sensor networks, addressing and communications. Context aware security. **(10)**

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 Ivan Stojmenovic , Handbook of Wireless Networks and Mobile Computing, John Wiley & sons Inc, Canada, 2002.

2 Asoke K Taukder,Roopa R Yavagal,Mobile Computing, Tata McGraw Hill Pub Co. , New Delhi, 2005.

3 Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.

4 Uwe Hansmann etl , Pervasive Computing, Springer, New York,2001.

Course Outcomes

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

- Explain emerging technologies in the context of wireless networks [K2]
- Explain about the mobile computing environment [K2]
- Explain handoff, mobility and location management schemes. [K2]
- Explain about the context aware and pervasive computing environment [K2]
- Explain about service discovery technologies. [K2]

P14CSTE33 ROBOTICS AND COMPUTER VISION 3 0 0 3

Course Objectives

- To understand various issues involved in robotics.
- To familiarize specific computer vision algorithms.
- To learn about template matching and classification.

Robots and Sensing (**9)**

Direct kinematics problem – Trajectory planning – Range sensing – Proximity sensing – Touch sensors – Force and torque sensing

Control of Robot Manipulators **(9)**

Introduction – Control of Puma robot arm – Computed torque technique – Near-minimum time control – Variable structure control – Feedback control – Motion control – Adaptive control

Segmentation **(9)**

What is segmentation? - Human vision: Grouping and Gestalt - Applications: Shot boundary detection and Background subtraction - Image segmentation by Clustering pixels - Segmentation by Graph-theoretic clustering - Hough Transform - Fitting Lines - Fitting Curves - Fitting as a Probabilistic Inference problem - Robustness.

Model-Based Vision **(9)**

Initial assumptions - Obtaining Hypotheses by pose consistency - Obtaining Hypotheses by Pose clustering - Obtaining Hypotheses uses Invariants – Verification - Application: Registration in Medical imaging systems - Curved surfaces and alignment - Elements of Differential geometry -Contour geometry.

Finding Templates and Relations Between Templates (**9)**

Classifiers - Building classifiers from Class Histograms - Feature selection - Neural networks -Support vector machine - Finding objects by Voting on relations between templates - Relational reasoning using Probabilistic models and search - Using classifiers to prune search - Hidden Markov models - Applications: Hidden Markov models and Sign language understanding - Finding people with Hidden Markov models.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

Reference Books

1 K.S.Fu, R.C.Gonzalez and C.S.G.Lee, "Robotics- Control, Sensing, Vision and Intelligence", McGraw Hill, 1987.

2 David A.Forsyth and Jean Ponce, "Computer Vision- A Modern Approach", PHI, 2009.

3 Robert J.Schilling, "Fundamentals of Robotics", PHI, 2010.

4 Richard D.klaffer, Thomas A.Chmielewski and Michael Neign, "Robotic Engineering", PHI, 1989.

5 Ballard.D.H and Brown.C.M, "Computer vision", PHI, Englewood Cliffs, 1982.

Course Outcomes

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

- List various sensing methods [K1].
- Discuss about the control of robot manipulators [K6]
- Apply different segmentation methods over images [K3]
- Explain about contour geometry [K2]
- Construct feature selection and classification algorithms [K3]

P14CSTE41 NEURAL NETWORKS AND FUZZY SYSTEMS 3 0 0 3

OBJECTIVES

- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for interfacing systems.
- To familiarize with Fuzzy sets and relations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing.

Feed Forward Networks And Supervised Learning (**9)**

Biological Neural Networks - Artificial Neuron- Activation Functions, Learning rules- Hebb Network- Perceptron Networks- Adaline- Madaline-Back propagation networks- Learning factors- Linear Separability.

Single Layer Feedback Networks (8)

Hopfield Network-Associative Memories- Recurrent auto association memory –Bi-directional Associative memory-Boltzmann machine.

Unsupervised Learning Networks (9)

Neural Network based on competition - Maxnet -Hamming Network- Self-Organizing feature Maps- Learning Vector Quantization - Adaptive Resonance Theory Network – Counter propagation Network.

Fuzzy Sets and Relations (9)

Crisp Set-Vagueness-Uncertainty and Impression-Fuzziness-Basic Definitions-Basic set theoretic Operations for Fuzzy –Types-Operations-Properties- Crisp and Fuzzy relations-Fuzzy relation-Cardinality Operations, Properties-Fuzzy Cartesian product and Composition-Non-Interactive fuzzy sets- Tolerance and Equivalence relations-Fuzzy Ordering relations-Composition of fuzzy relations – Crisp to fuzzy conversion – membership function.

Fuzzy–To–Crisp Conversions and Applications of Neural Networks and Fuzzy Logic (10)

Lambda cuts for fuzzy sets and relations-Definitions- De-fuzzification methods.

Pattern Recognition-Image compression- Fuzzy Pattern Recognition- Fuzzy Image compression

L: 45 Hours T: 0 Hour Total: 45 Hours

REFERENCE BOOKS

1 Laurene Fausette,"Fundamentals of Neural Networks", Pearson Education, New Delhi, 2004.

2 Timothy Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, Singapore, 2000.

3 Limin Fu, "Neural Networks in Computer Intelligence" Tata McGraw Hill Publishing Company, New Delhi, 2006.

4 Sivanandam S N and Paulraj M, "Introduction to Artificial Neural Networks" Vikas Publishing House Private Limited, NewDelhi, 2003.

5 Rajasekaran S and Vijayalakshmi Pai G A, "Neural Networks, Fuzzy Systems and Genetic Algorithms", Prentice Hall of India, New Delhi, 2003.

5 Haykins, "Neural Networks – A Comprehensive foundation", Prentice Hall of India, New Delhi, Second Edition 2003.

6 Zimmermann H J, "Fuzzy set theory and its Applications", Allied Publishers Ltd, New Delhi, 1999.

COURSE OUTCOMES

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

- Explain about the basics of Neural Networks [K2]
- Explain about the basic of Fuzzy Logic and its applications [K2]
- Develop appropriate classification algorithm using supervised learning technique for various problems [K3]
- Develop appropriate clustering algorithm using unsupervised learning technique [K3]
- Utilize tools to study complexity of the systems [K3]

P14CSTE42 **ADHOC AND SENSOR NETWORKS** **3 0 0 3**

OBJECTIVES

- To learn about MAC, Routing, QoS, power and energy management in adhoc networks
- To study about the architecture and protocols of wireless sensor networks
- To learn about mesh networks

Ad-Hoc Mac **(9)**

Introduction – Issues in Ad-Hoc Wireless Networks. MAC Protocols – Issues, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol.

Ad-Hoc Network Routing & TCP **(9)**

Issues – Classifications of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc – Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

WSN –MAC **(9)**

Introduction – Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols – self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

WSN Routing, Localization & QOS **(9)**

Issues in WSN routing – OLSR, AODV. Localization – Indoor and Sensor Network Localization. QoS in WSN.

Mesh Networks **(9)**

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 C.Siva Ram Murthy and B.Smanoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2004.

2 Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2004.

3 C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2002

4 Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly Publishers, 2007.

COURSE OUTCOMES

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

- Summarize the issues in adhoc and sensor networks.[K2]
- Classify the adhoc MAC protocols, routing protocols for unicast and multicast[K4]
- List the issues in adhoc Transport layer and explain solutions for adhoc[K1]
- Summarize the sensor routing, localizations and QoS issues and solutions [K2]
- Explain the need and operation of mesh networks. [K2]

P14CSTE43 FAULT TOLERANT COMPUTING SYSTEM 3 0 0 3

OBJECTIVES:

- To understand the reliability engineering in a system perspective.
- To determine the type of redundancy either in the form of hardware or software module and the optimum number of redundant units.
- To understand the fault detection and activation technique of the necessary standby units in the repairable system in a quantitative manner.

Hardware Fault Tolerance (10)

Preliminaries - Fault classification- Types of Redundancy; Basic measures of Fault Tolerance - Hardware Fault Tolerance - The rate of hardware failures - Failure rate, Reliability, and Mean Time To Failure - Canonical and Resilient Structures - Other Reliability Evaluation Techniques - Fault-Tolerance – Processor-Level techniques – Byzantine Failures.

Information Redundancy and Fault-Tolerant Networks (9)

Coding –Resilient Disk Systems; Data Replication- Algorithm-Based Fault Tolerance -Measures of Resilience - Common Network Topologies and Their Resilience - Fault-Tolerant Routing.

Software Fault Tolerance (9)

Acceptance Tests - Single-Version Fault Tolerance - N-VersionProgramming - Recovery Block Approach - Preconditions, Postconditions and Assertions - Exception Handling - Software Reliability Models - Fault-Tolerant Remote Procedure Calls

Checkpointing (9)

Checkpointing - Checkpoint Level - Optimal Checkpointing – AnAnalytical Model - Cache-Aided Rollback Error Recovery - Checkpointing in Distributed Systems - Checkpointing in Shared Memory Systems - Checkpointing in Real-Time Systems - Other uses of Checkpointing.

Fault Detection in Cryptographic Systems (8)

Overview of Ciphers - Security Attacks through Fault Injection -Countermeasures - Case Studies: Non-Stop Systems - Stratus Systems - Cassini Command and Data Sub-System; IBM G5 - IBM Sysplex –n Itanium.

L: 45 Hours T: 0 Hour Total: 45 Hours

REFERENCE BOOKS

1 Israel Koren, C. Mani Krishna: Fault-Tolerant Systems, Elsevier, 2007.

2 Parag K. Lala,: Fault Tolerant and Fault Testable Hardware Design, BS Publications, 2011.

3 D. K. Pradhan (Ed): fault Tolerant Computer Systems Design, Prentice Hall, 1996.

4 K. S. Trivedi: Probability, Statistics with Reliability, Queuing and Computer Science Applications, John Wiley, 2002.

COURSE OUTCOMES

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

- Explain the fundamental concepts of fault-tolerance [K2]
- Explain the appropriate (hardware, software) detection and recovery techniques for a given environment [K2]
- Develop skills in modeling and evaluating fault-tolerant architectures in terms of reliability, availability and safety [K3]
- Explain the merits and limitations of fault-tolerant design [K2]

- Identify the various forms of redundancy for enhancing reliability of digital systems [K3]

P14CSTE44 CONTENT BASED INFORMATION RETRIEVAL 3 0 0 3

OBJECTIVES

- To introduce the fundamentals of image processing and image enhancements
- To introduce various databases used for retrieving images
- To introduce the concept of image retrieval based on image content

Fundamentals Of Image Processing **(9)**

Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological

Image Enhancement **(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

Multimedia Databases **(8)**

Definition – Applications – Data Structures – Image Databases – Video and Audio Processing – Query Languages – SQL Extension – Colour Based Retrieval – Texture Based Retrieval – Shape Based Retrieval – Multimedia Retrieval Frameworks

Image Retrieval **(10)**

Classification of Images Based on features – Image Segmentation – Region and Object Extraction – Video Parsing for Information Retrieval – Intelligent Search Agents – Evaluation of Image and Video Retrieval – Metrics for evaluation and procedures

Content Based Image Retrieval **(9)**

Multimedia Query Languages – Semantic Image Features – Image Queries Classification and Indexing schemes – Video Retrieval – Image Data Management – Standards – Current trends and applications

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing" Third Edition, Pearson Education, 2008

2 Michael S.Lew "Image and Video Retrieval", Springer – Verlag, 2002.

3 Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Second Edition, Thomson Learning, 2001

4 Anil K.Jain, "Fundamentals of Digital Image Processing", Person Education, 2003.

5 J.K.Wu, M.S.Kankanhalli, J.H.Lim, D.Z.Hong "Perspectives on Content Based Multimedia Systems", Kluwer Academic publishers, Boston,2000.

6 V.S.Subrahmanian and Susil Jajodia (Eds), "Multimedia Database Systems Issues and Reaserch directions",Springer –Verlag, 1996.

7 Setrag Khosafian and A.Brad Baker, "Multimedia and Image Databases" Morgan Kaufmann, 1996.

COURSE OUTCOMES

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

- Explain the fundamental concepts of fault-tolerance [K2]
- Explain the appropriate (hardware, software) detection and recovery techniques for a given environment [K2]
- Develop skills in modeling and evaluating fault-tolerant architectures in terms of reliability,

availability and safety [K3]

- Explain the merits and limitations of fault-tolerant design [K2]
- Identify the various forms of redundancy for enhancing reliability of digital systems [K3]

P14CSTE51 **MULTI AGENT SYSTEMS** **3 0 0 3**

OBJECTIVES

- To enable students to learn about intelligent agents
- To learn the various aspects of multi-agent functioning
- To learn about its applications

(9)

Introduction – Intelligent Agents-Deductive reasoning Agents – Agents as theorem provers-Agent Oriented Programming - Concurrent MetateM.

(9)

Practical Reasoning Agents-Reactive and Hybrid Agents - Brook's and Subsumption Achitecture –The Limitations of Reactive Agents - Hybrid Agents –Understanding each other.

(9)

Communication - Speech Acts - Agent Communication Languages – Ontologies for Agent Communication - Coordination Languages. Working Together - Cooperative Distributed Problem Solving - Task Sharing and Result Sharing Coordination – Multiagent Planning and Synchronization – Methodologies.

(9)

Applications - Multi-agent interactions – Making group decisions- Forming coalitions.

(9)

Allocating scarce resources- Bargaining- Arguing- Logical foundations.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Michael Wooldridge, "An Introduction to MultiAgent Systems", II edition, John Wiley & Sons, Ltd. 2009.

2 Gerhard Weiss, "MultiAgent Systems: A Modern Approach to Distributed Artificial Intelligence", The MIT press, 2000.

COURSE OUTCOMES

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

- Describe the working of intelligent agents and reasoning agents [K1]
- Explain how communication takes place between agents in a multi-agent environment [K2]
- Discuss a few applications of multi-agent systems [K2]
- Identify the methods for making agents to work together[K2]
- Summarize the logical foundations of multi-agent systems [K2]

P14CSTE52 **SWARM INTELLIGENCE** **3 0 0 3**

OBJECTIVES

- To become familiar with Meta heuristics and the concepts of intelligence.
- To familiarize with Particle Swarm Optimization and Ant Colony Optimization algorithm useful while seeking global optimum in self-learning situations.
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on swarm intelligence.

Fundamentals **(9)**

Foundations – Models and Concepts of Life and Intelligence – Symbols, Connections and Optimization by Trail and error.

Social Organism, Partial Swarm Techniques and Collective Intelligence Techniques **(9)**

Non-Existence as Entities: The Social Organism, Human – Actual, Imagined and Implied, Thinking is Social, Introduction to Partial Swarm Techniques and Collective Intelligence Techniques.

Collective Intelligence And Particle Swarm Intelligence **(9)**

Variations, Comparisons, Implications and speculations in Collective Intelligence and Particle Swarm Intelligence

Ant Colony Optimization **(9)**

Introduction to Ant Systems, Ant Colony Optimization Technique, Pheromones and its Density as Deciding Factor, Applications of Ant Colony Optimization in Discrete Mathematics Problem – Travelling Salesman Problem

Applications of Swarm Intelligence **(9)**

Applications in Wired, Wireless and Wireless Sensor Networks – Routing and Clustering, Applications in other Computer Science Areas

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 James Kennedy, Russell C. Eberhart, with Yuhui Shi, "Swarm Intelligence", Morgan Kaufmann, 2001.

2 Andries P. Engelbrecht, "Computational Swarm Intelligence", Wiley, John & Sons, 2006.

3 Eric Bonabeau, Marco Dorigo, and Guy Theraulaz, "Swarm Intelligence: From Natural to Artificial Systems", Oxford University Press, 1999.

COURSE OUTCOMES

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

- Identify problems in various domains and provide solutions[K3]
- Design software and hardware solutions, experiment and report the results to get optimal solutions [K6]
- Design a computer based system that will fully meet the requirements of the end user[K6]
- Make use of modern software tools and platforms to solve problems efficiently[K3]
- Develop confidence for self education and ability for life-long learning [K3]

P14CSTE53 PERFORMANCE EVALUATION OF COMPUTER NETWORKS 3 0 0 3

OBJECTIVES

- To select appropriate evaluation techniques, performance metrics and workloads for a system.
- To conduct performance measurements correctly.
- To design measurement and simulation experiments to provide the most information with the least effort.
- To use simple queuing models to analyze the performance of systems.

Introduction **(9)**

Need for performance evaluation – Role of performance evaluation - performance evaluation Methods – Performance Metrics and Evaluation Criteria – CPU and I/O Architectures – Distributed and Network Architectures– Secondary Storage – Topologies – Computer Architecture - Fundamental Concepts and Performance Measures.

Probability and Stochastic Processes **(9)**

Scheduling Algorithms – Workloads – Random Variables – Probability Distributions – Densities – Expectation – Stochastic Processes – Poisson Process – Birth-Death Process – Markov Process

Queuing Theory **(9)**

Queuing Systems – Networks of Queues - Estimating Parameters and Distributions – Computational Methods – Simulation Process – Time Control – Systems and Modeling

Petri Nets And System Performance **(9)**

Petri Nets – Classical Petri Nets – Timed Petri Nets – Priority-based Petri Nets – Colored Petri Nets – Generalized Petri Nets – Tool Selection – Validation of Results – Performance Metrics – Evaluation – Multiple Server Computer System Analysis

Database System Performance Analysis and Analysis of Computer Networks Components **(9)**

Test bed systems - database systems - test bed performance analysis testing.

Simulation Modelling of Local Area Networks.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Paul J. Fortier, Howard E. Michael, “Computer Systems Performance Evaluation and Prediction”, Elsevier Science (USA), 2003.

2 Thomas G. Robertazzi, “Computer Networks and Systems: Queueing theory and Performance Evaluation”, Third Edition, Springer, 2000.

3 Domenico Ferrari, “Giuseppe Serazzi", Alexandro Zeijher, Measurement & Tuning of Computer Systems –Prentice Hall Inc,1983

4 Michael F.Mories and Paul F.Roth,. “Tools and techniques, Computer Performance Evaluation”, Van Nostrand, New York, 1982

COURSE OUTCOMES

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

- Outline the need and role of performance evaluation of computer systems.[K2]
- Apply mathematical models for system representation and performance measurement.[K3]

- Translate the system into Petri nets representation to have better understanding.[K2]
- Compare various the database systems and their performances.[K2]
- Outline various components of computer network and to understand its simulation.[K2

P14CSTE54 **WEB DATA MINING** **3 0 0 3**

OBJECTIVES

- To evolve multidimensional intelligent model from a typical system
- To represent multi dimensional data for a data warehouse
- To Discover the knowledge imbibed in the high dimensional system
- To find the hidden interesting patterns in web data
- To introduce Web Crawling and wrapper generation

Data Warehousing And Data Mining **(9)**

Definition – Components – Multidimensional Data Model – Data Cube – Dimension Modeling – OLAP Operations – Data Warehouse Architecture Meta Data – Types of Meta Data – Data Warehouse Implementation – Data warehouse Backend Process – Development Life Cycle – data Mining process – Association Rules and Sequential Patterns – Apriori Algorithm – Data Formals – Mining with multiple - Minimum supports – Mining Class Association Rules – GSP – Prefix Span – Generating Rules from Sequential Patterns.

Classification **(9)**

Supervised Learning– Decision Tree Induction–Classifier Evaluation – Rule Induction Classification Based on Association–Types of Classification.

Unsupervised learning - K – means Clustering – Representation of Clusters – Hierarchical Clustering-Distance-Function-Data Standardization-Handling of Mixed Attributes – Cluster Evaluation- Discovering Holes and Data Regions.

Partially Supervised Learning – Learning from Labeled and unlabeled Examples-EM Algorithm – Learning from Positive and Unlabeled Examples.

Web Mining and Link Analysis **(9)**

Retrieval, Search and Link Analysis: Information Retrieval- Information Retrieval Models-Relevance Feedback- Evaluation Measures – Text and Web Page pre-Processing-Inverted Index and its Compression- Latent Semantic Indexing – Web search – Meta Search: combining Multiple Rankings- Combination Using Similarity Scores – Web Spamming.

Social Network Analysis Co-Citation and Bibliographic coupling-Page Rank HITS-Community

Web Crawling and Wrapper Generation **(9)**

Web Crawling – Algorithm – Implementation Issues – Types – Crawler Ethics and Conflicts.

Structured data Extraction: Wrapper Generation – Wrapper Induction – Instance – Based Wrapper Learning – Automatic wrapper Generation: Problems – String Matching and Type Matching Multiple Alignment – Building DOM Trees – Extraction Based on Multiple Pages – Using Techniques in Previous Sections.

Information Integration –Schema matching – Pre-Processing for Schema Matching-Combining similarities-Integration of Web Query Interfaces-Constructing a Unified Global Query Interface.

Opinion and Web Usage Mining **(9)**

Opinion Mining –Sentiment Classification-Feature-Based Opinion Mining and Summarization –Comparative Sentence and Relation Mining-Opinion Search-Opinion Spam.

Web Usage Mining-Data Collection and Pre-Processing-Data Modeling for Web Usage Mining-Discovery and Analysis of Web Usage Patterns -Discussion and Outlook - Current Trends.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Liu. B, "Web Data Mining, Exploring Hyperlinks, Contents and Usage Data", Springer, 2007.

2 Alex Berson, Stephen J. Smith "Data Warehousing, Data Mining,& OLAP", Tata Mcgraw- Hill, 2004.

3 REFERENCE BOOKSJiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman Publishers, 2000.

4 Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997.

5 Paulraj Ponnaiah, "Data Warehousing Fundamentals", Wiley Publishers, 2001.

6 Usama M.Fayyad, Gregory Piatetsky Shapiro, Padhrai Smyth, Ramasamy Uthurusamy, "Advances in Knowledge Discover and Data Mining", The M.I.T Press, 1996

COURSE OUTCOMES

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

- Apply the association rules for real life web mining applications [K3]
- Design and deploy appropriate Classification and clustering techniques for various problems with high dimensional data using supervised and unsupervised learning [K6]
- Discover the knowledge from unstructured high dimensional data source [K4]
- Evaluate various web mining techniques on complex data objects [K5]
- Explain about the necessity of preprocessing and its procedure for web usage mining [K2]

P14CSTE61 **FORENSIC COMPUTING AND REVERSE ENGINEERING** **3 0 0 3**

OBJECTIVES

- To familiarize the practice of reverse engineering suspicious files by utilizing static and dynamic tactics, techniques and procedures.
- To gain an understanding of the impact that the suspicious file may have on a particular computer system when executed.

Understanding Information **(9)**

Binary systems and memory - Addressing – Number systems – Characters – Computer programs -Records and Files – File Types and Signatures - Use of Hexadecimal Listings – Word processing formats – Magic Numbers – Graphic Formats – Archive Formats - Other Applications

Systems Concepts And Pc Hardware **(9)**

Two Black Boxes – Worked example - Program, Data, Rules and Objects - Software Development - Breaking Sequence – An Information Processing System - Black Box Model - Buses and Motherboard – Intel Processors and Design of the PC - Memory – Backing Store Devices - Floppy Disk Drive Units - External Peripherals – Expansion Cards

Disk Geometry **(9)**

Five Main issues – Physical Construction of the Unit - Formation of Addressable Elements - Encoding Methods and Formats for Floppy Disks – Construction of Hard Disk Systems - Encoding Methods and Formats for Hard Disks – Formatting Process – Hard Disk Interfaces - IDE/ATA Problems - Drives

Reversing Foundations **(9)**

Reverse Engineering - Software Reverse Engineering -Applications - Low-Level Software - Reversing Process - Tools- Is Reversing Legal? - Code Samples & Tools

Reversing Tools **(9)**

Different Reversing Approaches - Disassemblers – Debuggers - Decompilers - System-Monitoring Tools - Patching Tools - Miscellaneous Reversing Tools.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Eldad Eilam, "Reversing: Secrets of Reverse Engineering", Wiley publishing, 2005

2 A J Sammes, Brian Jenkinson, "Forensic Computing: A Practitioner's Guide", Springer, 2nd end, 2007.

3 Hacker Disassembling Uncovered, Kris Kaspersky, A-LIST Publishing, 2nd edition, 2003.

4 Michael A. Caloyannides, "Privacy Protection and Computer Forensics", Artech House, 2nd edition, 2004

5 Warren G.Kruse II, Jay G. Heiser, "Computer Forensics: Incident Response essentials", Addison-Wesley Professional, 1st edition, 2001.

COURSE OUTCOMES

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

- Compare different graphic formats used in computers [K4]
- Outline the design of PC with suitable peripherals [K2]
- Explain different encoding methods and formats for floppy disks [K2]
- List the applications of Reverse engineering [K1]
- Summarize various reversing tools available [K2]

P14CSTE62 **SPEECH TECHNOLOGY** **3 0 0 3**

OBJECTIVES

- To tag a given text with basic Language processing features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a Language
- To design a tag set to be used for statistical processing keeping an application in mind
- To design a Statistical technique for a new application
- To compare and contrast use of different statistical approaches for different types of applications

Introduction **(9)**

Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues - Applications - The role of machine learning - Probability Basics –Information theory – Collocations -N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

Morphology and Part Of Speech Tagging **(9)**

Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields

Syntax Parsing **(9)**

Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars - Features and Unification -Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs.

Semantic Analysis **(9)**

Representing Meaning – Semantic Analysis -Lexical semantics –Word-sense disambiguation - Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics-Semantic Role Labeling and Semantic Parsing– Discourse Analysis.

Applications **(9)**

Named entity recognition and relation extraction- IE using sequence labeling- Machine Translation (MT) -Basic issues in MT-Statistical translation-word alignment-phrase-based translation – Question Answering

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2 edition, 2008

2 Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999

3 Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition, 2009

4 Roland R. Hausser, Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Paperback, MIT Press, 2011

5 Pierre M. Nugues, An Introduction to Language Processing with Perl and

Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Soft cover reprint, 2010

6 James Allen, Natural Language Understanding, Addison Wesley; 2 edition, 1994

7 NLTK – Natural Language Tool Kit - http://www.nltk.org/

COURSE OUTCOMES

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

- Demonstrate an understanding of Natural Language Processing tasks in syntax, semantics, and pragmatics [K2]
- Demonstrate an understanding of Morphology and Part of Speech Tagging [K2]
- Apply syntax parsing techniques [K3]
- Explain the use of semantic analysis methods [K2]
- Discuss a few applications of NLP [K2]

P14CSTE63 EMBEDDED SYSTEM DESIGN 3 0 0 3

OBJECTIVES

- To have an idea of the basics of embedded systems.
- To study the hardware tools for designing embedded applications.
- To study about embedded software development process.

Embedded Design Life Cycle **(9)**

Product specification – Hardware / Software partitioning – Detailed hardware and software design – Integration – Product testing – Selection Processes – Microprocessor Vs Micro Controller – Performance tools – Benchmarking – RTOS Micro Controller – Performance tools – Benchmarking – RTOS availability – Tool chain availability – Other issues in selection processes.

Partitioning Decision **(9)**

Hardware / Software duality – Coding hardware – ASIC revolution – Managing the Risk – Co-verification – execution environment – memory organization – System startup – Hardware manipulation – memory mapped access – speed and code density

Interrupt Service Routines **(9)**

Watchdog timers – Flash Memory – A basic toolset – Host based debugging – Remote debugging – ROM emulators – Logic analyzer – Caches – Computer optimization – Statistical profiling.

In-Circuit Emulators **(9)**

Buller proof run control – Real time trace – Hardware break points – Overlay memory – Timing constraints – Usage issues – Triggers.

Testing **(9)**

Bug tracking – reduction of risks & costs – Performance – Unit testing – Regression testing – Choosing test cases – Functional tests – Coverage tests – Testing embedded software – Performance testing – Maintenance.

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Arnold S. Berger, "Embedded System Design", CMP books, USA, 2002

2 Sriram V Iyer, Pankaj Gupta, "Embedded Real time System Programming", Tata McGraw Hill, 2008.

3 ARKIN, R.C., Behaviour-based Robotics, The MIT Press, 1998.

4 David E.Simon, "An Embedded Software Primer", Pearson Education, 2003.

5 Daniel W Lewis, "Fundamentals of Embedded Software", Pearson Education Asia, 2001.

6 Steve Heath, "Embedded System Design", Elsevier, Second Edition, 2004

COURSE OUTCOMES

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

- Explain about the detailed hardware and software design [K2]
- List various types of testing for embedded software [K1]
- Assess memory organization for effective partitioning [K5]
- Explain the benefits of real time tracing [K2]
- Compare host based debugging and remote debugging [K4]

P14CSTE64 INFORMATION RETRIEVAL TECHNIQUES 3 0 0 3

OBJECTIVES

- To introduce the fundamentals of information retrieval process and querying
- To introduce various databases used for retrieving multimedia contents
- To introduce the information retrieval procedures for online IR system

Introduction **(9)**

Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation –Word Sense Disambiguation

Querying **(9)**

Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages

Text Operations And User Interface **(9)**

Document Preprocessing – Clustering – Text Compression - Indexing and Searching – Inverted files – Boolean Queries – Sequential searching – Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points – Query Specification - Context – User relevance Judgment – Interface for Search

Multimedia Information Retrieval **(9)**

Data Models – Query Languages – Spatial Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction

Applications **(9)**

Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards

L: 45 Hours **T: 0 Hour** **Total: 45 Hours**

REFERENCE BOOKS

1 Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", Pearson Education Asia, 2005.

2 G.G. Chowdhury, "Introduction to Modern Information Retrieval", Neal-Schuman Publishers; 2nd edition, 2003.

3 Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, 2000

4 David A. Grossman, Ophir Frieder, " Information Retrieval: Algorithms, and Heuristics", Academic Press, 2000

5 Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, "Text Information Retrieval Systems", Academic Press, 2000

COURSE OUTCOMES

- Explain various types of data structures used for retrieval [K2]
- Illustrate query processing for pattern matching [K2]
- Compare various types of indexing and clustering methods [K2]
- Identify appropriate search techniques for a given problem[K3]
- Experiment with different text searching algorithms for real life problems [K3]