M.E. COMPUTER SCIENCE AND ENGINEERING

COURSES OF STUDY AND SCHEME OF ASSESSMENT

(MINIMUM CREDITS TO BE EARNED: 80)

Category	Course Title	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER I								
Program Core	Mathematics and Statistics for Computer Science	3	1	0	4	40	60	100
Program Core	Advanced Data Structures and Algorithms	3	1	0	4	40	60	100
Program Elective	Program Elective – I	3	1	0	4	40	60	100
Program Elective	Program Elective - II	3	1	0	4	40	60	100
Program Core	Advanced Data Structures and Algorithms Lab	0	0	4	2	40	60	100
Program Core	Advanced Database Management System Laboratory	0	0	4	2	40	60	100
Mandatory courses	Research Methodology and IPR	2	0	0	2	40	60	100
Audit Course	Audit Course – 1	0	0	0	0	40	60	100
		14	**4**	**8**	**22**			

Category	Course Title	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER II								
Program Core	Unix Internals	3	1	0	4	40	60	100
Program Core	Compiler Optimization	3	1	0	4	40	60	100
Program Elective	Program Elective - III	3	1	0	4	40	60	100
Program Elective	Program Elective - IV	3	1	0	4	40	60	100
Program Core	Machine Learning Techniques Laboratory	0	0	4	2	40	60	100
Program Core	Unix Laboratory	0	0	4	2	40	60	100
Program Core	Mini Project	0	0	4	2	40	60	100
Audit Course	Audit Course – 2	0	0	0	0	40	60	100
		12	**4**	**12**	**22**			

Category	Course Title	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER III								
Program Elective V	Program Elective -V	3	1	0	4	40	60	100
Open Elective	Open Elective	3	1	0	4	40	60	100
Internship	Internship	0	0	4	2	40	60	100
Project	Dissertation I	0	0	20	10	40	60	100
		6	**2**	**24**	**20**			

Category	Course Title	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER IV								
Project	Dissertation II	0	0	32	16	40	60	100
		0	**0**	**32**	**16**			

M.E. - COMPUTER SCIENCE AND ENGINEERING

CURRICULUM

LIST OF PROGRAM CORE COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21MES011	Mathematics and Statistics for Computer Science	3	1	0	4
21MES012	Advanced Data Structures and Algorithms	3	1	0	4
21MES013	Advanced Data Structures and Algorithms Lab	0	0	4	2
21MES014	Advanced Data Base Management System Laboratory	0	0	4	2
21MES015	Unix Internals	3	1	0	4
21MES016	Compiler Optimization	3	1	0	4
21MES021	Machine Learning Techniques Laboratory	0	0	4	2
21MES022	Unix Laboratory	0	0	4	2
21MES023	Mini Project	0	0	4	2
21MES024	Internship	0	0	4	2
21MES025	Project Dissertation I	0	0	20	10
21MES031	Project Dissertation II	0	0	32	16

LIST OF PROGRAM ELECTIVE COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21MES101	Component Based Development	3	1	0	4
21MES102	Performance Evaluation of Systems and Networks	3	1	0	4
21MES103	Knowledge Engineering	3	1	0	4
21MES104	Visualization Techniques	3	1	0	4
21MES105	Infometrics	3	1	0	4
21MES106	User Interface Design	3	1	0	4
21MES107	Network Engineering and Management	3	1	0	4
21MES108	Language Technologies	3	1	0	4
21MES109	Knowledge Management	3	1	0	4
21MES110	Integrated Software Project Management	3	1	0	4
21MES111	Principles of Multimedia	3	1	0	4
21MES112	Virtualization Techniques	3	1	0	4
21MES113	Service Oriented Architecture	3	1	0	4
21MES114	Ethical Hacking and Digital Forensics	3	1	0	4
21MES115	Database Tuning	3	1	0	4
21MES116	Enterprise Resource Planning	3	1	0	4
21MES117	Human Resources Management	3	1	0	4
21MES118	Big data Analytics	3	1	0	4
21MES119	Information Retrieval Techniques	3	1	0	4
21MES120	Social Network Analysis and Mining	3	1	0	4
21MES121	Data Mining Techniques	3	1	0	4
21MES122	Machine Learning Techniques	3	1	0	4
21MES123	Cloud Computing Technologies	3	1	0	4

21MES125	Cloud Storage Infrastructures	3	1	0	4
21MES126	Big Data Security	3	1	0	4
21MES127	Data Warehousing	3	1	0	4
21MES128	IoT Architecture and Protocols	3	1	0	4
21MES129	Deep Learning	3	1	0	4
21MES130	Blockchain And Cryptocurrency Technologies	3	1	0	4
21MES131	Data Center Networks	3	1	0	4
21MES132	Data Science With Python	3	1	0	4
21MES133	Intelligent Optimization Techniques	3	1	0	4
21MES134	Advanced Cryptography Techniques	3	1	0	4
21MES135	Data Analytics	3	1	0	4
21MES136	Applied Cryptography And Network Security	3	1	0	4
21MES137	Artificial Neural Networks	3	1	0	4
21MES138	Advanced Graph Theory	3	1	0	4
21MES139	Bio-Inspired Computing	3	1	0	4
21MES140	Sensing Techniques and Sensors	3	1	0	4
21MES141	Advanced Computer Architecture	3	1	0	4
21MES142	Object Oriented Systems Engineering	3	1	0	4
21MES143	Parallel Algorithms	3	1	0	4
21MES144	Multicore Architectures	3	1	0	4
21MES145	Advanced Operating Systems	3	1	0	4
21MES146	Pattern Recognition Techniques	3	1	0	4
21MES147	Advanced Database Technology	3	1	0	4

LIST OF OPEN ELECTIVE COURSES(GEC)

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21MES151	Speech Processing	3	1	0	4
21MES152	Bio informatics	3	1	0	4
21MES153	ASIC Design	3	1	0	4
21MES154	Embedded Systems	3	1	0	4
21MES155	Mobile and Pervasive Computing	3	1	0	4
21MES156	Medical Image Processing	3	1	0	4
21MES157	Invehicle Intelligent Transportation System	3	1	0	4
21MES158	Wireless Adhoc and Sensor Networks	3	1	0	4
21MES159	Network Protocols	3	1	0	4
21MES160	Network routing Algorithms	3	1	0	4
21MES161	Signal Processing Techniques For Speech Recognition	3	1	0	4
21MES162	OFDM and MIMO Communication Systems	3	1	0	4
21MES163	Adaptive Signal Processing	3	1	0	4
21MES164	Advanced Digital Image Processing	3	1	0	4
21MES165	Transform Techniques and Partial Differential Equation	3	1	0	4
21MES166	Mobile Ad-Hoc Wireless Sensor Networks	3	1	0	4
21MES167	Wireless Sensor Protocols and Programming	3	1	0	4
21MES168	Mobile and Wireless Security				

LIST OF AUDIT COURSES (AC)

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21MACI11	Constitution of India	0	0	0	0
21MACI12	Safety Management	0	0	0	0
21MACI21	Disaster Management	0	0	0	0
21MACI22	Pedagogy Studies	0	0	0	0
21MACI31	Stress Management by Yoga	0	0	0	0
21MACI32	Value Education	0	0	0	0

SYLLABUS OF PROGRAM CORE COURSES

21MES011 MATHEMATICS AND STATISTICS FOR COMPUTER SCIENCE 3 1 0 4

COURSE OBJECTIVES:

- To explore graph structures and their applications.
- To make the students, decompose the matrices into required form and to know its uses.
- 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 component analysis.

UNIT I GRAPH STRUCTURES 12

Graph representations – Regular Graph structures – Connectivity – Cycles – Graph coloring – Chromatic number – Chromatic partitioning – Chromatic polynomial –Vertex Covers- Independent sets – Spanning Trees – Fundamental circuits – Spanning trees in a weighted graph - Network flows.

UNIT II ADVANCED MATRIX THEORY 12

Eigen values using QR transformations – Generalized Eigen vectors – Canonical forms – Singular value decomposition and applications – Pseudo inverse – Least square approximations.

UNIT III ESTIMATION THEORY 12

Unbiased estimators – Method of moments – Maximum likelihood estimation – Curve fitting by principles of least squares – Regression lines.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Type I and II errors – Test based on Normal, t, F and Chi-square distributions for testing of Mean, Variance and Proportions – Tests for independence of Attributes and Goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 12

Random Vectors and Matrices - Mean vectors and covariance matrices - Multivariate Normal density and its properties - Principal components - Population Principal components - Principal components for Standardized variables.

TOTAL: 60 hours

COURSE OUTCOMES:

After Successful completion of the course, the students should be able to

CO1.Explain probability distributions of discrete and continuous random variables.

CO2.Design and build solutions for a real-world problem by applying relevant distributions

CO3.Evaluate and Perform hypothesis testing and to conclude

CO4.Use effectively the various algorithms for applications involving probability and statistics in computing (data analytics)

CO5.Understand the key techniques and theory behind the type of random variable and distribution

TEXT BOOK:

1. Narsingh Deo., "Graph Theory with Applications to Engineering and Computer Science", Prentice-Hall of India ,2014.

REFERENCES:

1. Bronson, R., "Matrix Operation, Schaum's outline series", McGraw Hill, New York, Second Edition, 2011.
2. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan & Sons, 11th edition, 2018.
3. Richard A.Johnson and Dean W.Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Asia, Sixth edition, 2007

21MES012 ADVANCED DATA STRUCTURES AND ALGORITHMS 3 1 0 4

COURSE OBJECTIVES:

- To solve problems using different data structures and design techniques and to compare their performance, tradeoffs.
- To learn appropriate use and choice of standard data structures.
- To develop recursive algorithms for various applications.

UNIT I FUNDAMENTALS 12

Mathematical Induction - Asymptotic Notations – Properties of Big-oh Notation – Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – NP-Completeness – NP-Hard – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoff.

UNIT II HEAP STRUCTURES 12

Min/Max heaps – Array-Based Heaps - Heap-Ordered Trees and Half-Ordered Trees -Deaps – Leftist Heaps – Binomial Heaps: Structure –Operations- Changing Keys in Heaps – Fibonacci Heaps – Skew Heaps – Lazy-Binomial Heaps.

UNIT III SEARCH STRUCTURES 12

Binary Search Trees – Self balancing Binary Search Trees – Applications – The concept of balancing and its advantages – AVL Trees: Single and Double rotations – Red-Black trees – Multi-way Search Trees –B-Trees: Operations: Insert and Delete– Splay Trees: Rotation – Tries.

UNIT IV MULTIMEDIA STRUCTURES 12

Segment Trees – k-d Trees: Node structure – 2-D trees – insertion - deletion – Point Quad Trees: insertion – deletion - Expanded Node Type– Range Searches – MX-Quad Trees: Range Queries – R-Trees – TV-Trees: Node Structure –Search - Insertion – Deletion - Extending and contracting.

UNIT V ALGORITHMS 12

Huffman Coding – Convex Hull – Topological Sort – Tree Vertex Splitting – Activity Networks – Flow Shop Scheduling – Counting Binary Trees – Introduction to Randomized Algorithms.

TOTAL:60 hours

COURSE OUTCOMES:

After Successful completion of the course, the students should be able to

CO1.Design data structures and algorithms to solve computing problems

CO2.Design algorithms using graph structure and various string matching algorithms to solve real-life problems

CO3.Apply suitable design strategy for problem solving

CO4.Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

CO5.Comprehend and select algorithm design approaches in a problem specific manner.

TEXT BOOKS

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, Uiversity Press, 2007.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
3. V.S. Subramanian, Principles of Multimedia Database systems, Morgan Kaufman, 1998.

REFERENCES

1. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Prentice –Hall, 1988.

21MES013 ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY 0 0 4 2

COURSE OBJECTIVES:

- The lab is designed to help students develop skills to design and analyse advance data structures.
- To help students identify and apply the suitable data structure for a given problem.

EXERCISES RECOMMENDED

Implement the following using C/C++/Java

1. Write a program to perform the following operations on singly linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal.
2. Write a program to perform the following operations on doubly linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
3. Write a program that implements stack (its operations) using i) Arrays ii) linked list
4. Write a programs that implements Queue (its operations) using i) Arrays ii) linked list
5. Write C program that implements the Quick sort method to sort a given list of integers in ascending order.
6. Write C program that implement the Merge sort method to sort a given list of integers in ascending order.
7. Write C program that implement the SHELL sort method to sort a given list of integers in ascending order.
8. Write a program to perform the following:
   i) Creating a Binary Tree of integers
   ii) Traversing the above binary tree in preorder, inorder and postorder.
9. Write a C program to perform the following:
   i) Creating a AVL Tree of integers
   ii) Traversing the above binary tree in preorder, inorder and postorder.
10. Write a C program that uses functions to perform the following:
    i) Creating a SplayTree of integers
    ii) Traversing the above binary tree in preorder, inorder and postorder.
11. Write a C program to perform the following:
    i) Creating a B-Tree of integers
    ii) Traversing the above binary tree in preorder, inorder and postorder.
12. Write a program to simulate various graph traversing algorithms.

TOTAL: 40 Hours

COURSE OUTCOMES:

At the end of the course, a student will be able to
CO1: Implement List ADTs and their operations.
CO2: Develop programs for sorting.
CO3: Develop programs for implementing trees and their traversal operations.
CO4: Implement graph traversal algorithms.
CO5: Apply algorithm design techniques.

21MES013 ADVANCED DATABASE MANAGEMENT SYSTEM LABORATORY 0 0 4 2

COURSE OBJECTIVES:

- Explore the features of a Database Management Systems
- To interface a database with front end tools
- To understand the internals of a database system

EXERCISES RECOMMENDED

1. Distributed Database for Bookstore

2. Deadlock Detection Algorithm for distributed database using wait- for graph

3. Object Oriented Database – Extended Entity Relationship(EER)

4 Parallel Database – University Counselling for Engineering

5. Parallel Database – Implementation of Parallel Join & ParallelSort

6. Active Database – Implementation of Triggers & Assertions for Bank Database

7. Deductive Database – Constructing Knowledge Database for Kinship Domain (Family Relations)

8. Study and Working of WEKA Tool

9 Query Processing – Implementation of an Efficient QueryOptimizer

10 Designing XML Schema for Company Database

11. Building Web Applications using PHP & MySQL

12. Big Data Analytics using Hadoop

TOTAL: 40 Hours

COURSE OUTCOMES:

At the end of the course, a student will be able to
CO1 Create databases for database-driven applications.

CO2 Apply transaction management for suitable case study.

CO3 Implement query processing and optimization.

CO4 Analyze the applicability of advanced databases like DDBMS, OODBMS,etc. in real life scenarios.

CO5 Work in teams to create and implement distributed databases for real-life case study.

21MES___ **RESEARCH METHODOLOGY AND IPR** **2 0 0 2**

COURSE OBJECTIVE:

1. To Understand research problem formulation and analyze research related information with research ethics.
2. To Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

UNIT I INTRODUCTION TO RESEARCH 7

The hallmarks of scientific research – Building blocks of science in research – Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

UNIT II EXPERIMENTAL DESIGN 7

Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurement of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures

UNIT III DATA COLLECTION METHODS 7

Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and non-probabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size

UNIT IV DATA ANALYSIS AND RESEARCH REPORT 7

Data Analysis – Factor Analysis – Cluster Analysis – Discriminant Analysis – Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work.

UNIT V INTELLECTUAL PROPERTY RIGHTS 7

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TOTAL: 35 Hours

COURSE OUTCOMES:

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

CO1.Formulate a research problem for a given domain.

CO2.Perform literature review, and design theoretical and conceptual frameworks

CO3.Collect and analyze data using various data collection methods

CO4.Follow research ethics and develop technical reports

CO5.Comprehend concepts related to patents, trademark and copyright.

TEXT BOOK

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”

REFERENCES

1. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
2. Ranjit Kumar, 2nd Edition , “Research Methodology: A Step by Step Guide for beginners”
3. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
4. Mayall , “Industrial Design”, McGraw Hill, 1992.
5. Niebel , “Product Design”, McGraw Hill, 1974.
6. Asimov , “Introduction to Design”, Prentice Hall, 1962.
7. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.

21MES021 **UNIX INTERNALS** **3 1 0 4**

COURSE OBJECTIVE:

- To understand the kernel, I/O & files, process control, scheduling and memory management policies in unix.
- To understand the file organization and management.
- To know the various system calls and to have knowledge of process architecture, process control & scheduling and memory management.

UNIT I **OVERVIEW** **12**

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 concepts. 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.

IT II **FILE SUBSYSTEM** **12**

Internal representation of files:Inodes –Access Inodes – Releasing Inodes – Algorithm - Structure of a regular file – Allocation of contiguous file and fragmentation of free space - Directories – Conversion of a path name to an Inode – Algorithm - Super block – Inode assignment to a new file – Algorithm – Allocation of disk blocks – Algorithm.

UNIT III **SYSTEM CALLS FOR THE FILE SYSTEM** **12**

File System Calls - Open – Algorithm for opening a file - Read – Write - Algorithm for reading and writing a file – 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** **12**

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** **12**

Memory Management Policies : Swapping – Allocation of Swap Space - Swapping Processes Out - Demand paging – Data Structure for Demand Paging – Algorithm for Demand Paging - - The I/O Subsystem : Driver Interface – Algorithm for open and close a device – Disk Drivers - Algorithm – Terminal Drivers– Streams – Inter process communication.

TOTAL:60 hours

COURSE OUTCOME:

At the end of this course, the Student will be able to

CO 1. Able to understand the basic concepts of UNIX Operating System.

CO 2. Understand the various operational concepts of buffer and Inode.

CO 3. Discuss the various operations of File concepts.

CO 4. Illustrate the process states and transition, process control and scheduling

CO 5. Understand and apply the memory management policies and I/O system suitably in various applications

TEXT BOOK:

1. Maurice J. Bach, "The Design of the Unix Operating System", First Edition, Pearson Education, 1999

REFERENCE BOOKS:

1. B. Goodheart, J. Cox, "The Magic Garden Explained", Prentice Hall of India, 1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., "The Design and Implementation of the 4.3 BSD

21MES022 **COMPILER OPTIMIZATION** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the basic principles and techniques of compiler code generation for a wide range of computer architectures and programmable logic devices.
- To Understand and be able to implement a variety of simple optimizations.
- To develop an awareness of the function and complexity of modern compilers.
- To provide practical, hands-on experience in compiler design, writing and modification.

UNIT I INTRODUCTION 12

Compiler – Analysis of compiler – Principles Of Compiler – Compiler Structure – Properties of a Compiler – Optimization – Importance of Code optimization – Structure of Optimizing compilers – placement of optimizations in optimizing compilers – ICAN – Introduction and Overview – Symbol table structure – Local and Global Symbol table management

UNIT II CODE OPTIMIZATION 12

Intermediate representation – Issues – High level, medium level, low level intermediate languages – MIR, HIR, LIR – ICAN for Intermediate code – Optimization – Early optimization – Constant folding – scalar replacement of aggregates – Simplification – value numbering – constant propagation – redundancy elimination – loop optimization

UNIT III OPTIMIZING FOR PARALLELISM 12

Procedure optimization – in-line expansion – leaf routine optimization and shrink wrapping – register allocation and assignment – graph coloring – code scheduling – control flow and low level optimizations – inter-procedural analysis and optimization – call graph – data flow analysis – constant propagation – alias analysis – register allocation – global references – Optimization for memory hierarchy

UNIT IV SCHEDULING AND STORAGE ORGANIZATION 12

Code Scheduling – Speculative loads and boosting – Instruction scheduling – Speculative scheduling – Software pipelining – trace scheduling – percolation scheduling – Run-time support – Register usage – local stack frame – run-time stack – parameter passing – Code sharing – position–independent code – Symbolic and polymorphic language support.

UNIT V CASE STUDIES 12

Case Studies – Approaches to compiler development – The compiler development Environment – EQN – Preprocessor for typesetting mathematics – Compiler for Pascal – The C Compiler – The Fortran H compiler – IBM XL Compilers – Alpha compilers – PA – RISC assembly language – COOL – (Classroom Object oriented language) - Compiler testing tools – SPIM.

TOTAL:60 hours

COURSE OUTCOMES:

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

CO1.Identify the different forms of intermediate languages and analyzing programs.

CO2.Identify the different optimization techniques for simple program blocks.

CO3.Design performance enhancing optimization techniques.

CO4.Perform the optimization on procedures.

CO5.Ensure better utilization of resources.

1. Allen Holub "Compiler Design in C", Prentice Hall of India, 1990.(UNIT- I).
2. Steven S. Muchnick, "Advanced Compiler Design Implementation", Morgan Koffman – Elsevier Science, India, Indian Reprint 2003 (UNIT – II, UNIT – III, UNIT – IV).
3. Alfred Aho, V. Ravi Sethi, D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison Wesley, 1988. (UNIT –V)

REFERENCES

1. Charles N. Fischer, Richard J. Leblanc, "Crafting a compiler with C", Benjamin Cummings, 1991.

21MES023 MACHINE LEARNING TECHNIQUES LABORATORY 0 0 4 2

COURSE OBJECTIVES:

- To apply the concepts of Machine Learning to solve real-world problems
- To implement basic algorithms in clustering & classification applied to text & numeric data
- To implement algorithms emphasizing the importance of bagging & boosting in classification & regression
- To implement algorithms related to dimensionality reduction
- To apply machine learning algorithms for Natural Language Processing applications

EXERCISES RECOMMENDED

1. Solving Regression & Classification using Decision Trees
2. Root Node Attribute Selection for Decision Trees using Information Gain
3. Bayesian Inference in Gene Expression Analysis
4. Pattern Recognition Application using Bayesian Inference
5. Bagging in Classification
6. Bagging, Boosting applications using Regression Trees
7. Data & Text Classification using Neural Networks
8. Using Weka tool for SVM classification for chosen domain application
9. Data & Text Clustering using K-means algorithm
10. Data & Text Clustering using Gaussian Mixture Models
11. Dimensionality Reduction Algorithms in Image Processing applications
12. Application of CRFs in Natural Language Processing

TOTAL: 40 Hours

COURSE OUTCOMES:

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

CO1.Understand the concept of machine learning fundamentals

CO2.Apply the appropriate machine learning strategy for linear and graphical model

CO3.Apply the tree and probabilistic approach in learning

CO4.Analyze the evolutionary model in machine learning

CO5.Design and develop machine learning applications using tools.

21MES024 **UNIX LABORATORY** **0 0 4 2**

COURSE OBJECTIVES:

- To study the various linux commands
- To develop programs in unix operating system using C language

EXERCISES RECOMMENDED

1. Execution of various file/directory handling commands.
2. Simple shell script for basic arithmetic and logical calculations.
3. Shell scripts to check various attributes of files and directories.
4. Shell scripts to perform various operations on given strings.
5. Shell scripts to explore system variables such as PATH, HOME etc.
6. Shell scripts to check and list attributes of processes.
7. Execution of various system administrative commands.
8. Implementation of awk script that uses all of its features.
9. Using seed instruction to process /etc/password file.
10. Shell script to display list of users currently logged in.
11. Shell script to delete all the temporary files.
12. Write a shell script to search an element from an array using binary searching.

TOTAL:40 hours

COURSE OUTCOMES:

At the end of this course, the Student will be able to

CO 1. Execute various file/directory handling commands.

CO 2. Write shell script for basic arithmetic and logical calculations

CO 3. Create Shell scripts to check various attributes of files and directories

CO 4. Develop Shell scripts to perform various operations on given strings.

CO 5. Formulate Shell scripts to check and list attributes of processes

21MES025 **MINI PROJECT** **0 0 4 2**

COURSE OBJECTIVES:

1. To provide students for knowledge of Electronics Components and soldering techniques and its package information for electronics circuit design.
2. Knowledge for the assembling of electronics circuit with components on PCB (Printed Circuit Board) of circuit design.
3. Design and development of Small electronic project based on hardware and software for electronics systems.

SYLLABUS

Mini project may be carried out in one or more form of following:

Product preparations, working/non-working models, prototype development, fabrication of setups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society. The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

TOTAL:40 hours

COURSE OUTCOMES:

At the end of this course, students will be able to:

1. Students will be able to practice acquired knowledge within the chosen area of technology for project development.
2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Reproduce, improve and refine technical aspects for engineering projects.
4. Work as an individual or in a team in development of technical projects.
5. Communicate and report effectively project related activities and findings

21MES031 **INTERNSHIP** **0 0 0 2**

COURSE OBJECTIVES:

- To train the students to know how to move into employment or commercial market
- To opportunity for students to build confidence level and choose the right Career
- To deliver the totally different outlook towards career and future growth to the students which are far beyond the scope of regular classroom teaching.

SYLLABUS

- The Professors / Head of Department / students may identify IT or computer-based service / industrial organization preferably in the local vicinity with prior approval of the principal of concerned institution. Structured training to be detailed by the concerned supervisory faculty and a detailed report of the in plant training undergone shall be submitted by the student for evaluation.
- The students may be allowed to undergo in-plant training in any Government/Private organizations dealing IT/Computer based job or services.

TOTAL :30 HOURS

COURSE OUTCOMES :

At the end of this course, students will be able to:

CO1.Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

CO2.Ability to conduct research in the chosen fields of engineering.

CO3.Ability to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.

CO4.Awareness of the social, cultural, global and environmental responsibility as an engineer.

CO5.Capability and enthusiasm for self-improvement through continuous professional development and life-long learning.

21MES032 **PROJECT DISSERTATION –I** **0 0 20 10**

COURSE OBJECTIVES:

- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

SYLLABUS:

The student individually works on a specific topic approved by the head of the division under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of engineering design. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 180 Hours

COURSE OUTCOMES:

After successful completion of Project Work – Phase I, the student will be able to

CO1. Identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.

CO2. Develop the methodology to solve the identified problem.

CO3. Train the students in preparing project reports and to face reviews and viva-voce examination.

CO4. Get clear idea about the project work and they are in a position to carry out the remaining phase II work in a systematic way.

CO5. Able to identify one's need for further knowledge and continuously develop one's own competencies.

21MES032 **PROJECT DISSERTATION –II** **0 0 32 16**

COURSE OBJECTIVES:

- To solve the identified problem based on the formulated methodology.
- To develop skills to analyze and discuss the test results, and make conclusions.

SYLLABUS:

The student should continue the phase I work on the selected topic as per the formulated methodology under the same supervisor. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated based on the report submitted and the viva-voce examination by a panel of examiners including one external examiner

TOTAL: 360 Hours

COURSE OUTCOMES:

After successful completion of Project Work – Phase II, the student will be able to

CO1. Continue the phase I work on the selected topic as per the formulated methodology under the same supervisor.lve the identified problem based on the formulated methodology.

CO2. Develop skills to analyze and discuss the test results, and make conclusions.

CO3. On completion of the project work student will be in a position to take up any challenging practical problems in the field of construction engineering and management and find better solutions to it.

CO4. Ability to evaluate, and critically assess one's own and others' results

SYLLABUS

PROGRAM ELECTIVE COURSES

21MES101 **COMPONENT BASED DEVELOPMENT** **3 1 0 4**

COURSE OBJECTIVES:

- To build complicated software systems using off the shelf component so that the time to build the software diminish drastically.
- To enhance the quality of the software by improving the quality of the component.

UNIT I **INTRODUCTION** **12**

Software Components : component versus object programming – Modules–objects – fundamental properties of Component technology – modules – interfaces – callbacks – directory services – component architecture – components and middle ware.: roles of Architecture .components middleware

UNIT II **JAVA COMPONENT TECHNOLOGIES** 12

Threads – Java Beans – Events and connections – properties – introspection – JAR files : packaging of JAVA Components– reflection – object serialization – Enterprise Java Beans :Events and connections their properties – service oriented Architecture and Enterprise java bean – Distributed Object models – RMI and RMI-IIOP.

UNIT III **CORBA TECHNOLOGIES** **12**

Definition of CORBA technology: structure of ORB based systems Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture.

UNIT IV **COM AND .NET TECHNOLOGIES** **12**

COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls – .NET components: window forms, data management, ASP-Enterprise services - assemblies – appdomains – contexts – reflection – remoting.

UNIT V **COMPONENT FRAMEWORKS AND DEVELOPMENT** **12**

Connectors – contexts – EJB containers – CLR contexts and channels – Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools - assembly tools – Reusable components and services.

TOTAL: 60 hours

COURSE OUTCOMES:

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

CO1.Familiarization with Component Based Systems, their Purpose and Scope.

CO2.Analyze Software Engineering Practices related to Component Based Development.

CO3.Apply design of Software Component Infrastructures

CO4.Identify Component Based Development Technologies

CO5.Relate the concept of Legal and regulatory framework related to Component Based Development

TEXT BOOK

1. Clements Szyperski, "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003.

REFERENCES

1. Ed Roman, "Enterprise Java Beans", Third Edition , Wiley , 2004.

21MES102 PERFORMANCE EVALUATION OF SYSTEMS AND NETWORKS 3 1 0 4

COURSE OBJECTIVE:

To learn various techniques that is useful for experimental performance evaluation of different areas like experimental design, statistics (both parametric and non-parametric), data presentation, workload characterization, random number generation, simulation, queuing theory, and time series analysis/forecasting.

UNIT I PERFORMANCE EVALUATION TECHNIQUES 12

Introduction – Performance evaluation Techniques, metrics, and common mistakes, Data presentation techniques, Ratio games –Performance Characteristics – Requirement Analysis: Concepts –User, Device, Network Requirements – Process –Developing RMA , Delay, Capacity Requirements – Flow Analysis – Identifying and Developing Flows –Flow Models –Flow Prioritization –Specification.

UNIT II QUEUING MODELS 12

Random variables - Stochastic process : formal definition and basic properties and history –Link Delay components – Queuing Models: Arrival rate, occupancy, Delay – Little's Theorem – Birth & Death process: The equilibrium probabilities of a BD process , The time-dependent solution of a BD process – Queuing Disciplines.

UNIT III FIFO QUEUING SYSTEMS 12

Monrovian FIFO Queuing Systems – M/M/1 – M/M/a – M/M/∞ - M/G/1 – M/M/m/m and other Markov-Non-Monrovian and self-similar models – Network of Queues –Burke's Theorem : implications of Burke's Theorem – Klein rock approximation :slow truck effect –Jackson's Theorem.

UNIT IV MULTI-USER UPLINKS/DOWNLINKS 12

Multi-User Uplinks/Downlinks : Classical beam forming , SINR feasibility ,durability theory - Capacity Regions - Opportunistic Scheduling for Stability and Max Throughput - Multi-Hop Routing: Adaptive Quality of Service routing - Mobile Networks: Bandwidth optimization of wireless networks - Throughput Optimality and Backpressure.

UNIT V FLOW CONTROL AND PERFORMANCE METRICS 12

Performance of Optimal Lyapunov Networking - Energy Optimality- Energy-Delay Tradeoffs - Virtual Cost Queues - Average Power Constraints - Flow Control with Infinite Demand - Auxiliary Variables - Flow Control with Finite Demand - General Utility Optimization – Performance metrics of systems and networks and their determination.

TOTAL:60 hours

COURSE OUTCOMES:

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

CO 1. Apply queuing-based models to characterize systems and networks

CO 2. Use appropriate analytic tools to compute performance measures of interest (e.g., delay, throughput) for a given queuing system

CO 3. Design (or choose) the system parameters (e.g., server or link capacity) to achieve a given level of performance.

CO 4. Evaluate the relative merits of alternative system design solutions

CO 5. Understand various flow control and performance metrics of a system

TEXT BOOKS

1. James D.McCabe , Network Analysis , Architecture and Design , 2nd Edition,Elsevier,2003 (Unit 1,2)
2. Bertsekas & Gallager , Data Networks , second edition ,Pearson Education,2003 (Unit 2)
3. Introduction to Probability Models by Sheldon Ross (8th edition) Academic Press, New York ,2003 (Unit 3,4,5,)

REFERENCES

1. D. Bertsekas, A. Nedic and A. Ozdaglar, Convex Analysis and Optimization, Athena Scientific, Cambridge , Massachusetts , 2003
2. Nader F.Mir Computer and Communication Networks, Pearson Education.2007
3. Paul J.Fortier, Howard E.Michel, Computer Systems Performance Evaluation and Prediction, Elsevier,2003

21MES103 **KNOWLEDGE ENGINEERING** **3 1 0 4**

COURSE OBJECTIVES:

- To learn various innovative and appropriate technologies of engineering.
- To improve the academic andtechnical knowledge to solve global issues.

UNIT I INTRODUCTION 12

Key concepts – Why knowledge Representation and Reasoning – Language of first order Logic – Syntax, Semantics Pragmatics – Expressing Knowledge – Levels of Representation – Knowledge Acquisition and Sharing – Sharing Ontology – Language Ontology –Language Patterns – Tools for Knowledge Acquisition

UNIT II RESOLUTION AND REASONING 12

Proportional Case – Handling Variables and Qualifies: first order case ,Answer extraction, Equality – Dealing with Intractability – Reasoning with Horn Clauses - Procedural Control of Reasoning: algorithm design, Specifying goal order – Rules in Production – Description Logic - Vivid Knowledge – Beyond Vivid.

UNIT III REPRESENTATION 12

Object Oriented Representations – Frame Formalism: Generic and Individual frames ,Inheritance –Reasoning with frames – Structured Descriptions – Meaning and Entailment - Taxonomies and Classification – Inheritance – Networks –Strategies for Defensible Inheritance – Formal Account of Inheritance Networks.

UNIT IV DEFAULTS, UNCERTAINTY AND EXPRESSIVENESS 12

Defaults – Introduction – Closed World Reasoning – Circumscription – Default Logic Limitations of Logic – Fuzzy Logic – Nonmonotonic Logic – Theories and World – Semiotics – Auto epistemic Logic - Vagueness – Uncertainty and Degrees of Belief – Noncategorical Reasoning – Objective and Subjective Probability.

UNIT V ACTIONS AND PLANNING 12

Explanation and Diagnosis – Purpose – Syntax, Semantics of Context – First Order Reasoning – Modal Reasoning in Context – Encapsulating Objects in Context – Agents – Actions – Situational Calculus – Frame Problem – Complex Actions – Planning – Strips – Planning as Reasoning – Hierarchical and Conditional Planning.

TOTAL:60 hours

COURSE OUTCOMES:

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

CO 1. Evaluate reasoning and frame rules in production system.

CO 2. Apply uncertainty and degrees of belief for solving the problem.

CO 3. Determine Handling Variables ,Qualifies and analyze Description Logic and Vivid Knowledge

CO 4. Understand Purpose of planning, reasoning and analyze Hierarchical and Conditional Planning

CO 5. Remember the fundamentals of knowledge representation (logic-based, frame-based, semantic nets

TEXT BOOK

1. Ronald Brachman, Hector Levesque “Knowledge Representation and Reasoning “, The Morgan Kaufmann Series in Artificial Intelligence 2004

REFERENCES

1. John F. Sowa, " Knowledge Representation: Logical, Philosophical, and Computational Foundations", 2000
2. Arthur B. Markman, "Knowledge Representation", Lawrence Erlbaum Associates,1998

21MES104 **VISUALIZATION TECHNIQUES** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce visual perception and core skills for visual analysis.
- To make advance insightful visuals.
- To implement techniques in ranking analysis, deviation analysis, distribution analysis, correlation analysis, multivariate analysis.
- To understand issues and best practices in information.

UNIT I VISUALIZATION **12**

Introduction – what is visualization, Relation between visualization and other fields– Issues – Data Representation – Data Presentation – Interaction: interaction concepts ,interaction techniques screen space object space data space, Attribute space, data structure space-Animating Transformations

UNIT II FOUNDATIONS FOR DATA VISUALIZATION **12**

Data foundations :Types of data, Structure within and between records, Visualization stages: visualization variables – Experimental Semiotics based on Perception Gibson‘s Affordance theory :Re evaluating Gibson’s original concept of affordance, distinguishing between direct and mediated perception – A Model of Perceptual Processing – Types of Data.

UNIT III COMPUTER VISUALIZATION **12**

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Non Linear Magnification – Comparing Visualization of Information Spaces – Abstraction in computer Graphics – Abstraction in user interfaces.

UNIT IV MULTIDIMENSIONAL VISUALIZATION **12**

Visualizing Multivariate Functions Data and Distributions – One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees - Star Glyph, Scatter plot Matrix– Web Works – Data Mapping: text in 1D, Text in 2D, Text in 3D – Document Visualization – Workspaces: scientific visualization, data management, data processessing,flexibility.

UNIT V CASE STUDIES **12**

Small interactive calendars: calendar views,interactive views, search, usability study – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis-content analysis: description, process of content analysis,reliability in content analysis

TOTAL:60 hours

COURSE OUTCOMES:

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

CO 1. Create and use a range of analog and digital tools and techniques to translate the meaning of data into comprehensible visual or experiential content.

CO 2. Apply visual design principles to simple and complex models that tell the stories found in data.

CO 3. Evaluate and merge approaches to visualization with design principles to reveal patterns in data and present information from a human-centered perspective

CO 4. Understand the concept of visualization and learn the concept of interaction techniques screen space object space data space.

CO 5. Understand ways in which interaction and immersive experiences can encourage the generation and exploration of data-based hypotheses, today and in the future.

TEXT BOOKS

1. Colin Ware, “Information Visualization Perception for Design” Morgan Kaufmann Publishers, 2004, 2nd edition. (Unit 1,2)

2. Robert Spence “Information visualization – Design for interaction”,Pearson Education, 2nd Edition, 2007(Unit 3,4,5)

REFERENCE

1. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, “Readings in Information Visualization Using Vision to think”, Morgan Kaufmann Publishers.

21MES105 **INFOMETRICS** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the information properties of scientific and technical data.
- To learn how to measure and evaluate aspects of research data set usability.
- To have hands-on experience with data science and informatics tools

UNIT I **IT ORGANIZATION** **12**

Metrics that matter - Interpreting the metrics – Collecting the data – Managing the data – Obstacles to acquiring IT metrics information – Old data versus new graphical analysis – Core of software planning – Measuring the core metrics (Product, Quality, Process, Productivity, Time, Effort) – Estimating and controlling with the core metrics – Work output measurements.

UNIT II **MEASUREMENT PROGRAM APPROACHES** **12**

EDS Brazil metrics program – Measurement program implementation approaches :Assessing measurement frame work and guidelines– Bench marking: conceptual model for bench marking, semantics annotations – Data definition framework for defining software measurements.

UNIT III **SOFTWARE METRICS** **12**

Functional points as part of measurement program :mean time ,detect density, customer problem ,customer satisfaction– Estimation of software reliability – Establishing central support for software sizing activities – Using metrics to manage projects – Tracking software progress – Effectively utilizing software metrics.

UNIT IV **SOFTWARE ESTIMATION** **12**

Problems with measurements – Avoiding obstacles and common pitfalls – Unreported and unpaid overtime – Using software metrics for effective estimating – Estimating software development projects – Enhanced estimation on time within budget – Metrics in outsourcing – Lifigaton – The product of non practicing function point metrics – Applying statistical process central to software – Metrics in E-Commerce.

UNIT V **SOFTWARE DEFECT MANAGEMENT** **12**

Literature review – Defect removal effectiveness and quality planning : early detection of software errors, phase based defect removal model, characteristics of special case phase 2 model – Quality planning – Cost effectiveness of phase defect removal – Process maturity: level1, level2, level3, level4

TOTAL:60 hours

COURSE OUTCOMES:

At the end of this course, the studentwill be able to

CO 1. Understand the concept of Obstacles to acquiring IT metrics information

CO 2. Determine EDS Brazil metrics program.and analyze Tracking software progress

CO 3. Discuss the topic Functional points as part of measurement program and demonstrate Tracking software progress

CO 4. Handle Problems with measurements and discuss Metrics in E-Commerce

CO 5. Identify Defect removal effectiveness and quality planning and familiar with the concept of Process maturity.

TEXT BOOK

1. Stephen H. Kan, " Metrics and Models In Software Quality Engineering", First Edition, Pearson Education, 2003.

REFERENCES

1. N. Fenton, S. L. Pfleeger, "Software Metrics: A Rigorous and Practical Approach", Thomson Learning, 1997.
2. IT Measurement – A Practical Advice from the Experts", International Function Point Users Group, Pearson Education, 2002.

21MES106 **USER INTERFACE DESIGN** **3 1 0 4**

COURSE OBJECTIVES: To gain knowledge about how to create a User Interface, how to use different type of controls, menu usage and its different types and components, different methodologies used to implement it and how to use multimedia, prototypes and analyzing different types of testing

UNIT I INTRODUCTION **12**

Human Computer Interface – A brief History of Screen Design - Characteristics Of Graphics Interface –Direct Manipulation Graphical System – Web User Interface –Popularity –Characteristic of Web Interface Principles of User Interface Design

UNIT II HUMAN COMPUTER INTERACTION **12**

User Interface Design Process – Obstacles –Usability –Human Characteristics In Design – Human Interaction Speed – Business Functions and Requirement Analysis : Direct Methods and Indirect Methods – Basic Business Functions – Design Standards – System Training – Structures Of Menus – Functions Of Menus–Contents Of Menu– Formatting – Phrasing The Menu – Selecting Menu Choice–navigating Menus– Kinds of Graphical Menus.

UNIT III WINDOWS **12**

Window Characteristics– Components– Presentation Styles– Types– Managements– Organizations– Operations– Web Systems– Device Based Controls Characteristics–Screen Based Controls Characteristics – Operate Control – Text Entry Controls – Selection Control–Combination Control– Custom Control– Presentation Control.

UNIT IV MULTIMEDIA **12**

Text For Web Pages – Providing the Proper Feedback– Guidance & Assistance–International Consideration – Accessibility– Icons– Image– Multimedia – Coloring.

UNIT V WINDOWS LAYOUT– TEST **12**

Prototypes – Kinds Of Tests – Analyze ,Modify and Retest – Evaluating the Working System - Information Search – Visualization –Hypermedia – Software Tools : Interface Design Tools, Software Testing Tools

TOTAL:60 hours

COURSE OUTCOMES:

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

CO1.Design and develop various menus and their functions.

CO2.Construct Navigation that enables different guidelines of Human-Computer Interaction.

CO3.Enable users make social connections through various Interface Design Tools.

CO4.Configure forms with focused inputs.

CO5.Focus on patterns that bring clarity related to various multimedia functions.

TEXT BOOKS

1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley& Sons, 2007.
2. Ben Sheiderman, "Design The User Interface", Pearson Education, 2008.

REFERENCES

1. Alan Cooper, "The Essential Of User Interface Design", Wiley – Dream Tech Ltd.,2002

21MES107 NETWORK ENGINEERING AND MANAGEMENT 3 1 0 4

COURSE OBJECTIVES:

- To understand the need for interoperable network management and to learn to the concepts and architecture behind standards based network management.
- To understand the concepts and terminology associated with SNMP and to study the current trends in network management technologies.

UNIT I FOUNDATIONS OF NETWORKING 12

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.

UNIT II QUALITY OF SERVICE 12

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 12

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behaviour – Admission Control – MPLS Networks – Scheduling Policy mechanisms–FIFO –Priority –Round Robin-Principles and Mechanisms – Label Stacking – RSVP – Protocols for Real time Interactive Application - RTP/RTCP.

UNIT IV HIGH SPEED NETWORKS 12

Optical links – WDM systems – Optical Cross Connects – Optical paths and Networks – Principles of ATM Networks – B-ISDN/ATM Reference Model – ATM Header Structure – ATM Adaptation Layer – Management and Control – Service Categories and Traffic descriptors in ATM networks-Wireless LAN –Architecture of IEEE 802.11.

UNIT V NETWORK MANAGEMENT 12

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-Network Management Architecture- Security and privacy architecture.

TOTAL:60 hours

COURSE OUTCOMES:

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

CO 1. Analyze the concepts of ATM networks and their uses in different ATM adaptation layer and wireless LAN.

CO 2. Create and the develop the various concepts of different quality of service and traffic monitoring of IP networks.

CO 3. Design and develop different communication networks, switched networks and shared networks.

CO 4. Evaluate different communication protocols such as ICMP, CMIP, SNMP, SNMPV2 and SNMPV3.

Co 5. Understand and acquire the concepts of Differential service networks and MPLS networks.

TEXT BOOKS

1. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2007. (Unit I and Unit II)
2. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002. (Unit III)
3. Mani Subramaniam, 'Network Management: Principles and Practices', Pearson Education, 2000 (Unit IV and Unit V)

REFERENCES

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
2. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002

21MES108 **LANGUAGE TECHNOLOGIES** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce theories and techniques of natural language processing and language technology.
- To learn the whole field from speech recognition and synthesis to semantics and dialogue. It focuses on industrial or laboratory applications, such as document retrieval on the Internet, information extraction, conversational agents, and verbal interaction in virtual worlds.

UNIT I **INTRODUCTION** **12**

Natural Language Processing – Linguistic Background- Spoken language input and output Technologies – Written language Input - Mathematical Methods - Statistical Modelling and Classification Finite State methods Grammar for Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation.

UNIT II **INFORMATION RETRIEVAL** **12**

Information Retrieval architecture - Indexing- Storage – Compression Techniques – Retrieval Approaches – Evaluation - Search engines- commercial search engine features- comparison- performance measures – Document Processing - NLP based Information Retrieval – Information Extraction – Ontology – Taxonomy – Information Architecture.

UNIT III **TEXT MINING** **12**

Categorization – Extraction based Categorization- Clustering- Hierarchical Clustering- Document Classification and routing- finding and organizing answers from Text search – use of categories and clusters for organizing retrieval results – Text Categorization and efficient Summarization using Lexical Chains – Pattern Extraction.

UNIT IV **GENERIC ISSUES** **12**

Multilinguality – Machine aided human translation - Multilingual Information Retrieval and Speech processing – Automatic language identification - Multimodality – Text and Images – Modality Integration: Speech and gesture – Facial movement and speech recognition - Transmission and Storage – Speech coding - Evaluation of systems – Human Factors and user Acceptability – Assessment and evaluation.

UNIT V **APPLICATIONS** **12**

Machine Translation – Transfer Metaphor - Interlingua and Statistical Approaches - Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning. Discourse segmentation – Text tiling – Part-of-speech tagging – Markov model taggers – vector space model.

TOTAL:60 hours

COURSE OUTCOMES:

CO 1. Discuss about different clustering algorithm in text mining.

CO 2. Understand the concepts of various Natural Language Processing and Linguistics.

CO 3. Analyze the functions of different human translation and discuss Speech coding, Evaluation of systems and Human Factors.

CO 4. Evaluate various Machine Translation and Markov model taggers.

CO 5. Impact the importance of information Retrieval architecture.

TEXT BOOKS

1. Daniel Jurafsky and James H. martin, " Speech and Language Processing" , 2000.(1,2,3)

2. Ron Cole, J.Mariani, et.al “Survey of the State of the Art in Human Language Technology”, Cambridge University Press, 1997.(4)
3. Michael W. Berry “ Survey of Text Mining: Culstering, Classification and Retrieval”, Springer Verlag, 2003.(5)
4. Christopher D.Manning and Hinrich Schutze, “ Foundations of Statistical Natural Language Processing “, MIT Press, 1999.(5)

REFERENCES

1. James Allen “ Natural Language Understanding “, Benjamin/ Cummings Publishing Co. 1995.
2. Gerald J. Kowalski and Mark.T. Maybury, “Information Storage and Retrieval systems”, Kluwer academic Publishers, 2000.
3. Tomek Strzalkowski “ Natural Language Information Retrieval “, Kluwer academic Publishers, 1999

21MES109 **KNOWLEDGE MANAGEMENT** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the importance of Knowledge management and its different types in practice.
- To know the benchmark and different organizational approaches and technical platforms and to set up a first-step approach to introduce KM in practice.

UNIT I INTRODUCTION **12**

The value of Knowledge – Knowledge engineering and knowledge systems - Knowledge Engineering Basics – Principles – Model suites – Process rules - Knowledge Economy – The Task and Organizational Context – Case study: Social security services - Knowledge Management – Knowledge Management Ontology – KADS

UNIT II KNOWLEDGE MODELS **12**

Knowledge Model Components: Knowledge model – Domain knowledge – Inference knowledge – Task Knowledge - Template Knowledge Models –Configuration design - Reflective Knowledge Models– Knowledge Model Construction – Knowledge Identification– Knowledge specification – Knowledge refinement – Types of Knowledge Models.

UNIT III TECHNIQUES OF KNOWLEDGE MANAGEMENT **12**

Knowledge Elicitation Techniques – Characteristics – Elicitation scenario – Modeling Communication Aspects – Communication plan – Case study – Information exchange – Validation and Balancing – Knowledge Management and Organizational Learning – Case study: Organizational model – Task model – Agent model.

UNIT IV KNOWLEDGE SYSTEM IMPLEMENTATION **12**

Case Studies – Designing Knowledge Systems Structure preserving design – Design of prototypes – Distributed architectures – Knowledge Codification – Testing and Deployment – Knowledge Transfer and Knowledge Sharing – Knowledge System Implementation: Implementation in Prolog – Implementation in Aion.

UNIT V ADVANCED KNOWLEDGE MODELING **12**

Advanced Knowledge Modeling – Domain knowledge – Inference knowledge – Task knowledge - Value Networks – Business Models for Knowledge Economy – UML Notations – Project Management – Project planning – Assessing risks – Plan – Quality and project documentation – Case study: Nuclear reactor noise analysis.

TOTAL:60 hours

COURSE OUTCOMES:

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

CO1.Develop and discuss about various Components of Knowledge Model and demonstrate Knowledge Elicitation Techniques.

CO2.Analyze the concepts various Knowledge engineering and knowledge systems.

CO3.Understand the concepts of Distributed architectures and their protocols.

CO4.Evaluate various Techniques of Knowledge Management with different scenario.

CO5.Identify Advanced Knowledge Modeling

TEXT BOOKS

1. Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, “Knowledge Engineering and Management”, Universities Press, 2001.
2. Elias M.Awad & Hassan M. Ghaziri, “Knowledge Management”, Pearson Education, 2003.

REFERENCES

1. C.W. Holsapple, “Handbooks on Knowledge Management”, International Handbooks on Information Systems, Vol 1 and 2, 2003.

WEBLINKS

1. http://www.epistemics.co.uk
2. http://depts.washington.edu/pettt/papers/WIN_poster_text.pdf

21MES110 INTEGRATED SOFTWARE PROJECT MANAGEMENT 3 1 0 4

COURSE OBJECTIVES:

- To understand the requirement collection process for developing a software
- To earn the leadership qualities to manage people in an organization
- To understand the risk management for successful project completion

UNIT I PROJECT MANAGEMENT CONCEPTS 12

Evolution of Software Economics – Software Management Process Framework (Phases, Artifacts, Workflows, Checkpoints) – Software Management Disciplines (Planning / Project Organization and Responsibilities / Automation / Project Control) – Modern Project Profiles

UNIT II SOFTWARE ESTIMATION & COSTING 12

Problems in Software Estimation – Algorithmic Cost Estimation Process, Function Points, SLIM (Software LIfe cycle Management), COCOMO II (COnstructive COst MOdel) – Estimating Web Application Development – Concepts of Finance, Activity Based Costing and Economic Value Added (EVA) – Balanced Score Card.

UNIT III RISK MANAGEMENT 12

Risk Definition – Risk Categories – Risk Assessment (Identification / Analysis / Prioritization) – Risk Control (Planning / Resolution / Monitoring) – Failure Mode and Effects Analysis (FMEA)

UNIT IV METRICS 12

Need for Software Metrics – Classification of Software Metrics: Product Metrics (Size Metrics, Complexity Metrics, Halstead's Product Metrics, Quality Metrics), and Process metrics (Empirical Models, Statistical Models, Theory-based Models, Composite Models, and Reliability Models).

UNIT V PEOPLE MANAGEMENT 12

Team Management – Client Relationship Management – Defect management and its Metrics-Understanding Behavior – Organizational Behaviour: A Background –Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation– The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team–Decision Making– Leadership – Organizational Structures – Stress –Health And Safety – Case Studies**.**

TOTAL:60 hours

COURSE OUTCOME:

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

CO1.Apply project management concepts and techniques to an IT project.

CO2.Identify and analyze risks that could lead to IT project success or failure.

CO3.Apply project management concepts through working in a group as team leader or active team member on an IT project.

CO4.Calculate and analyze Software and Process Metrics

CO5.Design various estimation levels of cost and effort.

TEXT BOOK

1. Royce, W. "Software Project management: A Unified Framework", Addison- Wesley, 1998.

REFERENCES

1. McConnell, S. "Software Project: Survival Guide", Microsoft Press, 1998.
2. Cooper, R., "The Rise of Activity-Based Costing- PartOne: What is an Activity-Based Cost System?" Journal of Cost Management, Vol.2, No.2 (Summer 1988), pp.45 – 54.
3. Grant, J.L. "Foundations of Economic Value Added", John Wiley & Sons, 1997.
4. Kaplan, R.S., Norton, D.P. "The Balanced Scorecard: Translating Strategy into Action", Harvard Business School Press, 1996.

5. Boehm, B. W. "Software Risk Management: Principles and Practices" in IEEE Software, January 1991, pp32-41.
6. Fenton, N.E., and Pfleeger, S.L.. “Software Metrics: A Rigorous and Practical Approach, Revised” Brooks Cole, 1998.
7. Demarco, T. and Lister, T. “Peopleware: Productive Projects and Teams, 2nd Ed.”, Dorset House, 1999.

21MES111 **PRINCIPLES OF MULTIMEDIA** **3 0 0 3**

COURSE OBJECTIVE:

- To provide sound knowledge in scripting languages, user interface design, and efficient program development to create exciting, compelling interactive user experiences**.**

UNIT I **INTRODUCTION** **12**

Introduction to Multimedia – Characteristics – Utilities – Creation -Uses – Promotion – Digital Representation – Media and Data streams – Multimedia Architecture – Multimedia Documents

UNIT II **ELEMENTS OF MULTIMEDIA** **12**

Text: types – font - Unicode standard - text compression - file formats. – Image: types - image processing – standards - specification - device independent color models - gamma correction - file formats – Video :video signal transmission - signal formats - broadcasting standards - digital video standards - PC video - video file formats – Audio : acoustics - characteristics of sound - elements of audio system – microphone – amplifier – loudspeaker - audio mixer - digital audio - MIDI – Graphics – components of graphics system, co-ordinate system – plotter - Intro to 2D & 3D Graphics -surface characteristics and texture - lights – Animation :key frames & Tweening, techniques, principles of animation, 3D animation, file formats.

UNIT III **MULTIMEDIA SYSTEMS** **12**

Visual Display Systems – CRT - video adapter card - video adapter cable – LCD – PDP - optical storage media - CD technology - DVD Technology - Compression Types and Techniques – CODEC - GIF coding standards - lossy and lossless – JPEG - MPEG-1 - MPEG-2 - MP3 - Fractals – MMDBS

UNIT IV **MULTIMEDIA TOOLS** **12**

Authoring tools – features and types - card and page based tools - icon and object based tools - time based tools - cross platform authoring tools - Editing tools - text editing and word processing tools - OCR software - painting and drawing tools - 3D modeling and animation tools - image editing tools -sound editing tools - digital movie tools – plug -ins and delivery vehicles for www.

UNIT V **MULTIMEDIA APPLICATION DEVELOPMENT** **12**

Software life cycle – ADDIE Model – conceptualization – content collection and processing – story – flowline – script - storyboard - implementation - multiplatform issues – authoring – metaphors – testing – report writing - documentation - case study: -Web Application – Console Application – Distributed Application – Mobile Application - games consoles – iTV – kiosks – education

TOTAL:60 hours

COURSE OUTCOMES

At the end of this course, the studentwill be able to

CO1.Understand the techniques and technologies used in the development of multimedia solutions.

CO2.Explain the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).

CO3.Use and apply tools for image processing, video, sound and animation.

CO4.Apply methodology to develop a multimedia system.

CO5.Apply acquired knowledge in the field of multimedia in practice and independently continue to expand knowledge in this field.

TEXT BOOKS

1. Parekh R "Principles Of Multimedia" Tata McGraw-Hill, 2006.

2. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications" Prentice Hall, 1995.

REFERENCES

1. Tay Vaughan, "Multimedia: Making It Work" McGraw-Hill Professional, 2006

2. Deitel & Deitel "Internet & World Wide Web How to Program", Fourth Edition – Prentice Hall, 2008.

21MES112 VIRTUALIZATION TECHNIQUES 3 1 0 4

COURSE OBJECTIVES:

- To understand the need and concepts of virtualization and cloud computing
- To explore the types of virtualization,
- To understand the practical virtualization solutions and enterprise.

UNIT I OVERVIEW OF VIRTUALIZATION 12

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or 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 12

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 12

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 - Data-Path 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 12

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 12

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

TOTAL: 60 hours

COURSE OUTCOMES:

At the end of this course, the studentwill be able to

CO1.Determine the Computing Virtualization tools, applications and techniques

CO2.Able to understand Server Virtualization and Virtualization Platform

CO3.Estimate the technologies of Virtualization and Network Virtualization

CO4.To apply the concepts of Virtualization storage

CO5.Discuss the virtual machine products

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, APress 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.

21MES113 **SERVICE ORIENTED ARCHITECTURE** **3 1 0 4**

COURSE OBJECTIVES:

- To gain understanding of the basic principles of service orientation.
- To learn service oriented analysis techniques
- To learn advanced concepts such as service composition, orchestration and Choreography,
- To know about various WS specification standards

UNIT I ARCHITECTURE AND PROGRAMMING MODELS 12

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 WEB SERVICES 12

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 IMPLEMENTATION 12

SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software s a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices: service should be open forextension but closed for modification, favour composition over inheritance, principle of least knowledge.

UNIT IV META DATA MANAGEMENT AND XML SECURITY 12

Meta data management – XML security: Introduction, needs, standards – XML signature – XML Encryption: key management specification – SAML: Implementation – XACML – XKMS – WS-Security – Security in web service framework - advanced messaging

UNIT V DESIGNS AND APPLICATIONS 12

Transaction processing – paradigm – protocols and coordination-Service layer abstraction – Application Service Layer- Business Service Layer – Orchestration Service Layer – transaction specifications – SOA in mobile – research issues- Entity-centric business service design – Application service design – Task- centric business service design

TOTAL: 60hours

COURSE OUTCOMES:

CO1. Understand XML technologies

CO2. Understand service orientation, benefits of SOA

CO3. Understand web services and WS standards

CO4. Use web services extensions to develop solutions

CO5. Understand and apply service modeling, service oriented analysis and design for application development

TEXT BOOK

1. Eric Newcomer, Greg Lomow, “Understanding SOA with Web Services”, Pearson Education.

REFERENCES

1. Shankar Kambhampaly, “Service –Oriented Architecture for Enterprise Applications”, Wiley India Pvt Ltd, 2008.
2. Mark O’ Neill, et al. , “Web Services Security”, Tata McGraw-Hill Edition, 2003.

21MES114 ETHICAL HACKING AND DIGITAL FORENSICS 3 1 0 4

COURSE OBJECTIVES:

- To learn how illegal computer attacks are performed and how to counteract them
- To explore the nature of digital evidence and to focus on the law issues surrounding computer crime.

UNIT I INTRODUCTION 12

Definition of hacking: Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

UNIT II NETWORK FORENSICS 12

TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming.

UNIT III FUNDAMENTALS OF COMPUTER FRAUD 12

Fundamentals of Computer Fraud :the use of computers in occupational fraud,Asset Misappropriation Cash Schemes Skimming, Cash larceny, Fraudulent disbursements– Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.

UNIT IV PREVENTION STRATAGIES 12

Architecture strategies for computer fraud prevention: Service oriented architecture ,distributed system architecture, client server architecture – Protection of Web sites – Intrusion detection system :Active IDS, passive IDS – NIDS, HIDS: comparison of NIDS AND HIDS – Penetrating testing process – Web Services – Reducing transaction risks.

UNIT V FRAUD TAXONOMY 12

Key Fraud Indicator selection process customized taxonomies – Key fraud signature selection process – Accounting Forensics – Computer Forensics – Journaling and it requirements – Standardized logging criteria – Journal risk and control matrix – Neural networks – Misuse detection and Novelty detection.

TOTAL : 60 hours

COURSE OUTCOMES:

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

CO1.Learn various hacking methods.

CO2.Learn various issues related to hacking and produce a security assessment report.

CO3.Perform system vulnerability exploit attacks and system security vulnerability testing.

CO4.Perform digital forensics analysis upon networks and network devices and also utilize various forensic tools to collect digital evidence.

CO5.Utilize a systematic approach to computer investigations and Perform web based investigations.

REFERENCES

1. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.(UNIT 1,2)

2. Ankit Fadia " Ethical Hacking" second edition Macmillan India Ltd, 2006(UNIT 3,4,5)

21MES115 **DATABASE TUNING** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the fundamentals of relational databases, algebra and tuning.
- To learn the Normalization, denormalization, query optimization techniques, layouts, triggers and the methods of accessing multiple databases.
- To troubleshoot and analyze query access plan.

UNIT I FUNDAMENTALS OF TUNING 12

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

UNIT II INDEX TUNING 12

Types of Queries – Data Structures – B tree – B^+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison of Indexing and Hashing Techniques.

UNIT III QUERY OPTIMIZATION 12

Techniques - Tuning Relational Systems – Normalization – Tuning Denormalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases.

UNIT IV TROUBLESHOOTING 12

Query Plan Explainers – Performance Monitors – Event Monitors – Finding "Suspicious" Queries – Analyzing a Query's Access Plan – Profiling a Query Execution – DBMS Subsystems.

UNIT V CASE STUDIES 12

Transaction Chopping – Time Series Databases – Understanding Access Plans – Configuration Parameters: Oracle; SQL Server; DB2UDB – Distributed Database - Implementation.

Total:60 hours

COURSE OUTCOMES:

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

CO1.Comprehend the complex query processing techniques

CO2.Design and implement multimedia databases and writing query structure

CO3.Develop skill set in file organization, Query Optimization, Transaction management, and database administration techniques

CO4.Use Tuning tools for different operations, optimization to different mechanism of Database

CO5.Change Schema, Database update and Benchmark Databases.

REFERENCES

1. Dennis Shasha and Philippe Bonnet "Database Tuning, Principles, Experiments, and Troubleshooting Techniques", Elsevier Reprint 2005.

2. Thomas Connoly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education 2003.

3. M.Tamer Ozsu, Patrick Valduriez and S.Sridhar "Principles of Distributed Database Systems", Pearson Education 2007.

21MES116 **ENTERPRISE RESOURCE PLANNING** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the fundamental concepts of ERP systems, their architecture, and working of different modules in ERP.
- To develop and design the modules used in ERP systems and to customize the existing modules of ERP systems.

UNIT I INTRODUCTION TO ERP 12

Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

UNIT II ERP IMPLEMENTATION 12

Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

UNIT III BUSINESS MODULES 12

Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintanance – Materials Management – Quality Management – Sales and Distribution.

UNIT IV ERP MARKET 12

ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

UNIT V ERP – PRESENT AND FUTURE 12

Turbo Charge the ERP System – EIA – ERP and E–Commerce – ERP and Internet – Future Directions in ERP – EI components and patterns – XML as integrated language.

TOTAL : 60 hours

COURSE OUTCOMES:

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

CO1.Identify the important business functions provided by typical business software such as enterprise resource planning

CO2.Build an understanding of the fundamental concepts of ERP systems, their architecture, and working of different modules in ERP

CO3.Develop and design the modules used in ERP systems, and can customize the existing modules of ERP systems

CO4.Evaluate organizational opportunities and challenges in the design system within a business scenario

CO5.Create reengineered business processes for successful ERP implementation

TEXT BOOKS

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning” , Thomson Learning, 2001.

REFERENCES

1. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning – concepts and Planning”, Prentice Hall, 1998.
2. Jose Antonio Fernandez, “The SAP R/3 Handbook”, Tata McGraw Hill.

21MES117 HUMAN RESOURCE MANAGEMENT 3 1 0 4

COURSE OBJECTIVES:

- To develop HR leadership roles in the global environment.
- To focus on the knowledge, skills and competencies needed by HR professionals to excel in their jobs and to evolve as global business leaders.

UNIT I PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT 12

Evolution of human resource management – the importance of the human factor – objectives of human resource management – role of human resource manager – human resource policies – computer applications in human resource management.

UNIT II THE CONCEPT OF BEST FIT EMPLOYEE 12

Importance of human resource planning – forecasting human resource requirement – internal and external sources. Selection process-screening – tests - validation – interview - medical examination – recruitment introduction – importance – practices – socialization benefits.

UNIT III TRAINING AND EXECUTIVE DEVELOPMENT 12

Types of training, methods: traditional training apprenticeship training, job instruction training,-informal learning-purpose, benefits and resistance.-Managerial development and training- Executive development programmes – common practices - benefits – self development – knowledge management.-Evaluating Training effort,

UNIT IV SUSTAINING EMPLOYEE INTEREST 12

Compensation plan: Form of compensation,purpose of an effective compensation system – reward :intrinsic rewards ,extrinsic rewards, financial rewards– motivation – theories of motivation – career management :individual career, organizational and career developments – development, mentor :roles, Mentoring functions – protégé relationships.

UNIT V PERFORMANCE EVALUATION AND CONTROL PROCESS 12

Method of performance evaluation – feedback – industry practices. Promotion, demotion, transfer and separation – implication of job change. The control process – importance – methods – requirement of effective control systems grievances – causes – implications – redresser methods.

TOTAL : 60 Hours

COURSE OUTCOMES:

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

CO1.Understand the concept of human resource management and its relevance in organizations

CO2.To be aware of the role, functions and functioning of human resource department of the organizations

CO3.Analyze the strategic issues and strategies required to select and develop manpower resources

CO4.Develop the Competency to recruit, train, and appraise the performance of employees

CO5.Ability to handle employee issues and evaluate the new trends in HRM

REFERENCES

1. Decenzo and Robbins, Human Resource Management, Wilsey, 6th edition, 2001.
2. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India,2001.
3. Eugence Mckenna and Nic Beach, Human Resource Management, , Pearson Education Limited, 2002.
4. Dessler Human Resource Management, Pearson Education Limited, 2002.
5. Mamoria C.B. and Mamoria S.Personnel Management, Himalaya Publishing Company, 1997.
6. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.

21MES118 **BIG DATA ANALYTICS** **3 1 0 4**

COURSE OBJECTIVE:

1. To explore the fundamental concepts of big data analytics and to learn to analyze the big data using intelligent techniques.
2. To review and understand the various search methods and visualization techniques.
3. To learn the use of various techniques for mining data stream and Map Reduce Concepts.

UNIT I INTRODUCTION TO BIG DATA **12**

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II MINING DATA STREAMS **12**

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 III HADOOP **12**

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop-Analyzing the Data with Hadoop-Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV HADOOP ENVIRONMENT **12**

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud

UNIT V FRAMEWORKS **12**

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere Big Insights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

TOTAL : 60 hours

COURSE OUTCOMES:

The student will be able to:

CO1.Identify the various big data platforms, Analytic process and tools, Statistical Concepts

CO2.Demonstrate the Stream Concepts, and various big data processing techniques.

CO3.Understand the role of HDFS and Hadoop Mapreduce concepts.

CO4.Create, Configure and setup a Hadoop Cluster and demonstrate the running of Hadoop on Cloud

CO5.Discuss various Hadoop Ecosystem components and their roles, IBM InfoSphere Big Insights and Streams, Visualizations, Visual data analysis techniques

REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
4. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Analytics", JohnWiley& sons, 2012.

6. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
7. PeteWarden, "Big Data Glossary", O'Reilly, 2011.
8. Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
9. Da Ruan,Guoquing Chen, Etienne E.Kerre, GeertWets, Intelligent Data Mining, Springer,2007
10. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012
11. Michael Minelli (Author), Michele Chambers (Author), AmbigaDhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,Wiley Publications,2013
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

21MES119 **INFORMATION RETRIEVAL TECHNIQUES** **3 1 0 4**

COURSE 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: MOTIVATION **12**

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval –Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics–The impact of the web on IR ––IR Versus Web Search–Components of a Search engine

UNIT II MODELING **12**

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

UNIT III INDEXING **12**

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

UNIT IV CLASSIFICATION AND CLUSTERING **12**

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

UNIT V SEARCHING THE WEB **12**

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

TOTAL : 60 hours

COURSE OUTCOMES:

The student will be able to:
CO1.Explain the basic concepts of Information retrieval techniques.

CO2.Describe the Taxonomy and Characterization of IR Models.

CO3.List and Apply efficient techniques for the indexing of document objects that are to be retrieved

CO4.Discuss the clustering and searching techniques for different data base systems.

CO5.Describe the practical recommendations about deploying information retrieval systems in different search domains.

TEXT BOOKS:

1. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, “Modern Information Retrieval: The concepts and Technology behind Search” (ACM Press Books), Second Edition, 2011.

2. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, “Introduction to Information Retrieval”, Cambridge University Press, First South Asian Edition, 2008.

REFERENCES:

1. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, “Information Retrieval Implementing and Evaluating Search Engines”, The MIT Press, Cambridge, Massachusetts London, England, 2010.

21MES120 SOCIAL NETWORK ANALYSIS AND MINING 3 1 0 4

COURSE 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 appreciate the use of machine learning approaches for web content mining
- To learn about the extraction and mining tools for social networks
- To gain knowledge on web personalization and web visualization of social networks

UNIT IINTRODUCTION TO SOCIAL NETWORK ANALYSIS AND KNOWLEDGE REPRESENTATION 12

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- Knowledge Representation on the Semantic Web – Ontology languages for the Semantic Web – RDF and OWL - Modeling and aggregating social network data.

UNIT II SOCIAL MEDIA MINING 12

Data Mining Essential –Data Mining Algorithm - Web Content Mining – Supervised Learning – Decision tree Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-Based Clustering - Classification and Clustering – Vector Space Model – Latent semantic Indexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – Document Sentiment Classification

UNIT III EXTRACTION AND MINING COMMUNITITES IN WEB SOCIALNETWROKS 12

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 HUMAN BEHAVIOR ANALYSIS AND PRIVACY ISSUES 12

Understanding and Predicting Human Behavior 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 Countermeasure

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 12

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- Recommendation in Social Media: Challenges-Classical Recommendation Algorithms-Recommendation Using Social Context-Evaluating Recommendations.

TOTAL : 60 hours

COURSE OUTCOMES:

The student will be able to:

CO 2. Understand the essentials of data mining in social media and exposed to various supervised and unsupervised learning techniques
CO 3. Demonstrate the social network analysis in a scientific way, retaining a focus on dissemination for business insights
CO 4. Construct a simple Human Behavior Analysis and understand Privacy Issues in mining analysis.
CO 5. Discuss the various visualization techniques for social networks

TEXT BOOKS:

1. Peter Mika, "Social networks and the Semantic Web", Springer, 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 2010.
3. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data- Centric Systems and Applications)", Springer; Second Edition, 2011.
4. Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, "Social Media Mining", Cambridge UniversityPress, 2014.

REFERENCES:

1. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", Springer, 2011.
2. Dion Goh and Schubert Foo, "Social information retrieval systems: emerging technologies andApplications for searching the Web effectively", Idea Group, 2007.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and social Information retrieval and access: Techniques for Improved User Modelling", Information Science Reference,2009.
4. John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2010.

21MES121 **DATA MINING TECHNIQUES** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Data Mining.
- To develop skills of using recent data mining software for solving practical problems.
- To gain experience of doing independent study and research.

UNIT I INTRODUCTION TO DATA MINING **12**

Introduction to Data Mining – Data Mining Tasks – Components of Data Mining Algorithms – Data Mining supporting Techniques – Major Issues in Data Mining – Measurement and Data – Data Preprocessing – Data sets

UNIT II OVERVIEW OF DATA MINING ALGORITHMS **12**

Overview of Data Mining Algorithms – Models and Patterns – Introduction – The Reductionist viewpoint on Data Mining Algorithms – Score function for Data Mining Algorithms- Introduction – Fundamentals of Modeling – Model Structures for Prediction – Models for probability Distributions and Density functions – The Curve of Dimensionality – Models for Structured Data – Scoring Patterns – Predictive versus Descriptive score functions – Scoring Models with Different Complexities – Evaluation of Models and Patterns – Robust Methods.

UNIT III CLASSIFICATIONS **12**

Classifications – Basic Concepts – Decision Tree induction – Bayes Classification Methods – Rule Based Classification – Model Evaluation and Selection – Techniques to Improve Classification Accuracy – Classification: Advanced concepts – Bayesian Belief Networks- Classification by Back Propagation – Support Vector Machine – Classification using frequent patterns.

UNIT IV CLUSTER ANALYSIS **12**

Cluster Analysis: Basic concepts and Methods – Cluster Analysis – Partitioning methods – Hierarchical methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering – Advanced Cluster Analysis: Probabilistic model based clustering – Clustering High – Dimensional Data – Clustering Graph and Network Data – Clustering with Constraints.

UNIT V ASSOCIATION RULE MINING AND VISUALIZATION **12**

Association Rule Mining – Introduction – Large Item sets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rule Techniques – Measuring the Quality of Rules – Visualization of Multidimensional Data – Diagrams for Multidimensional visualization – Visual Data Mining – Data Mining Applications – Case Study: WEKA.

TOTAL: 60 hours

COURSE OUTCOMES:

The student will be able to:

CO 1. Identify the various data mining tasks, Components of Data Mining Algorithms and Major Issues in Data Mining.
CO 2. Understand the overview of the data Mining Algorithms.
CO 3. Demonstrate and compare the various Classification algorithms and techniques.
CO 4. Discuss the basic concepts and methods used for Cluster Analysis.
CO 5. Illustrate the concept of Association rule mining Visual Data Mining techniques and its applications

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber , Jian Pei, "Data Mining: Concepts and Techniques", Third Edition (The Morgan Kaufmann Series in Data Management Systems), 2012.

2. David J. Hand, Heikki Mannila and Padhraic Smyth “Principles of Data Mining” (Adaptive Computation and Machine Learning), 2005

REFERENCES:

1. Margaret H Dunham, “Data Mining: Introductory and Advanced Topics”, 2003
2. Soman, K. P., Diwakar Shyam and Ajay V. “Insight Into Data Mining: Theory And Practice”, PHI, 2009.

21MES122 **MACHINE LEARNING TECHNIQUES** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the concepts of Machine Learning.
- To appreciate supervised learning and their applications.
- To appreciate the concepts and algorithms of unsupervised learning.
- To understand the theoretical and practical aspects of Probabilistic Graphical Models.
- To appreciate the concepts and algorithms of advanced learning.

UNIT I INTRODUCTION **12**

Machine Learning–Types of Machine Learning –Machine Learning process- preliminaries, testing Machine Learning algorithms, turning data into Probabilities, and Statistics for Machine Learning-Probability theory – Probability Distributions – Decision Theory.

UNIT II SUPERVISED LEARNING **12**

Linear Models for Regression – Linear Models for Classification- Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models – Decision Tree Learning – Bayesian Learning, Naïve Bayes – Ensemble Methods, Bagging, Boosting, Neural Networks, Multi-layer Perceptron, Feed- forward Network, Error Back propagation - Support Vector Machines.

UNIT III UNSUPERVISED LEARNING **12**

Clustering- K-means – EM Algorithm- Mixtures of Gaussians –Dimensionality Reduction, Linear Discriminant Analysis, Factor Analysis, Principal Components Analysis, Independent Components Analysis.

UNIT IV PROBABILISTIC GRAPHICAL MODELS **12**

Graphical Models – Undirected Graphical Models – Markov Random Fields – Directed Graphical Models –Bayesian Networks – Conditional Independence properties – Markov Random Fields-Hidden Markov Models – Conditional Random Fields(CRFs).

UNIT V ADVANCED LEARNING **12**

Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling – Computational Learning Theory – Mistake Bound Analysis – Reinforcement learning – Markov Decision processes, Deterministic and Non-deterministic Rewards and Actions, Temporal Difference Learning Exploration.

Total: 60 hours

COURSE OUTCOMES:

CO1.Differentiate between supervised, unsupervised, semi-supervised machine learning approaches

CO2.Discuss the decision tree algorithm and identity and overcome the problem of over fitting

CO3.Discuss and apply the back propagation algorithm and genetic algorithms to various problems

CO4.Apply the Bayesian concepts to machine learning

CO5.Analyze and suggest appropriate machine learning approaches for various types of problems

TEXT BOOKS:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.

2. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Chapman andHall, CRC Press, Second Edition, 2014.

REFERENCES:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.

3. Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997

21MES123 CLOUD COMPUTING TECHNOLOGIES 3 1 0 4

COURSE OBJECTIVES:

To impart knowledge on

- To familiarize with the types of virtualization.
- To understand the concept of cloud and utility computing.
- To understand the various cloud platforms an the need for clou security
- To familiarize with the cloud programming model.
- To appreciate the emergence of cloud as the next generation computing paradigm and the need for cloud security

UNIT I CLOUD INFRASTRUCTURE 12

Scalable Computing over the Internet – Technologies for Network based Systems - System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture-Cloud Computing and Services Model –Public, Private and Hybrid Clouds – Cloud Eco System - IaaS - PaaS – SaaS

UNIT II VIRTUALIZATION STRUCTURES 12

Implementation Levels of Virtualization - Virtualization Structures – Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource Management – Virtualization for Data-Center Automation

UNIT III CLOUD SYSTEM MODEL 12

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Public Cloud Platforms- GAE, AWS, and Azure- Inter Cloud Resource Management – VM Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources - Cloud Security and Trust Management.

UNIT IV CLOUD SECURITY - MIDDLEWARE AND TESTING 12

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, OpenStack. CloudSim – Architecture - Cloudlets – VM creation – Broker – VM allocation – Hosts – Data Center.

UNIT V CLOUD APPLICATIONS AND CASE STUDIES 12

Cloud Computing Risk Issues – Cloud Computing Security Challenges – Cloud Computing Security Architecture – Trusted cloud Computing – Identity Management and Access Control – Autonomic Security. Dynamic Resource Allocation Using Virtual Machines for Cloud Computing Environment

TOTAL: 60 HOURS

COURSE OUTCOMES:

CO1.Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

CO2.Identify the architecture, infrastructure and delivery models of cloud computing

CO3.Virtualization in cloud computing increases the use of virtual machines

CO4.Explain the core issues of cloud computing such as security, privacy and interoperability

CO5.Choose the appropriate technologies, algorithms and approaches for the related issues.

TEXT BOOK

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. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010

REFERENCES

1. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly

3. Zhen Xiao, Weijia Song, And Qi Chen, "Dynamic Resource Allocation Using Virtual Machines For Cloud

Computing Environment", IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS, VOL. 24, NO. 6, JUNE 2013.

4. Rajkumar Buyya, Christian Vecchiola, S.Tamarai Selvi, "Mastering Cloud Computing", TMGH,2013.

5. Rodrigo N.Calheiros, Rajiv Ranjan, Anton Beloglazov, César A. F. De Rose, and Rajkumar Buyya, "CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms ", Cloud Computing and Distributed Systems (CLOUDS) Laboratory.

WEBLINKS

1. http://www.buyya.com/papers/CloudSim2010.pdf

21MES124 CLOUD SECURITY 3 1 0 4

COURSE OBJECTIVES

- Compare modern security concepts as they are applied to cloud computing
- Assess the security of virtual systems
- Evaluate the security issues related to multi-tenancy

UNIT I SECURITY CONCEPTS: 12

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems: Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.

UNIT II MULTI-TENANCY ISSUES: 12

Isolation of users/VMs from each other. How the cloud provider can provide this; Virtualization System Security Issues: e.g. ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; Virtualization System Vulnerabilities: Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware (botnets etc).

UNIT III VIRTUALIZATION SYSTEM-SPECIFIC ATTACKS: 12

Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyperjacking.

UNIT IVTECHNOLOGIES FOR VIRTUALIZATION-BASED SECURITY ENHANCEMENT 12

IBM security virtual server protection, virtualization-based sandboxing; Storage Security: HIDPS, log management, Data Loss Prevention. Location of the Perimeter.

UNIT V LEGAL AND COMPLIANCE ISSUES: 12

Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Total: 60 hours

COURSE OUTCOMES:

CO1.Cloud security involves the procedures and technology that secure cloud computing environments against both external and insider cyber security threats

CO2.Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.

CO3.Explain the core issues of cloud computing such as resource management and security

CO4.Be able to install and use current cloud technologies

CO5. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOK:

1. Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance [ISBN: 0596802765]

REFERENCES:

1. Ronald L. Krutz, Russell Dean Vines, Cloud Security [ISBN: 0470589876]
2. John Rittinghouse, James Ransome, Cloud Computing [ISBN: 1439806802]
3. J.R. ("Vic") Winkler, Securing the Cloud [ISBN: 1597495921]
4. Cloud Security Alliance 2009, Security Guidance for Critical Areas of Focus in Cloud

21MES125 CLOUD STORAGE INFRASTRUCTURES 3 1 0 4

COURSE OBJECTIVES

- Critically appraise the opportunities and challenges of information management in complex business environments.
- Evaluate information storage management design in a cloud environment and how it relates to the business objectives of an organization.
- Analyze the role technology plays in the design of a storage solution in cloud architecture.

UNIT I VIRTUALIZED DATA CENTER ARCHITECTURE 12

Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures.

UNIT II INFORMATION STORAGE SECURITY & DESIGN 12

Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments. Monitoring and management; security auditing and SIEM.

UNIT III STORAGE NETWORK DESIGN 12

Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.

UNIT IV OPTIMIZATION OF CLOUD STORAGE 12

Global storage management locations, scalability, operational efficiency. Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attitudes; file systems or object storage.

UNIT V INFORMATION AVAILABILITY DESIGN 12

Designing backup/recovery solutions to guarantee data availability in a virtualized environment. Design a replication solution, local remote and advanced. Investigate Replication in NAS and SAN environments. Data archiving solutions; analyzing compliance and archiving design considerations.

Total: 60 Hours

COURSE OUTCOMES:

CO1.A virtual data center is a product of the Infrastructure as a Service (IaaS) delivery model of cloud computing.

CO2.Storage security is the group of parameters and settings that make storage resources available to authorized users and trusted networks -- and unavailable to other entities.

CO3.SANs are primarily used to access data storage devices, such as disk arrays and tape libraries from servers so that the devices appear to the operating system as direct-attached storage

CO4.Identify Global storage management locations

CO5.Learn Investigate Replication in NAS and SAN environments

TEXT BOOK:

1. Greg Schulz, “Cloud and Virtual Data Storage Networking”, Auerbach Publications [ISBN: 978-1439851739], 2011.

REFERENCES

1. Marty Poniatowski, “Foundations of Green IT” Prentice Hall; 1 edition [ISBN: 978-0137043750], 2009.
2. EMC, “Information Storage and Management” Wiley; 2 edition [ISBN: 978- 0470294215],2012
3. Volker Herminghaus, Albrecht Scriba, “Storage Management in Data Centers” Springer; editioN [ISBN: 978-3540850229]. 2009.
4. Klaus Schmidt, “High Availability and Disaster Recovery” Springer; edition [ISBN: 978-3540244608], 2006.

21MES126 **BIG DATA SECURITY** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce concepts related to big data security
- To analyse data on a large scale
- To learn about the significant security challenges, when trying to make quick decisions in Big Data environment
- To be familiar about the data breach and the complications related to it

UNIT I BIG DATA PRIVACY, ETHICS AND SECURITY **12**

Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security.

UNIT II SECURITY, COMPLIANCE, AUDITING, AND PROTECTION **12**

Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems.

UNIT III HADOOP SECURITY DESIGN **12**

Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration.

UNIT IV HADOOP ECOSYSTEM SECURITY **12**

Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume, HBase, Sqoop.

UNIT V DATA SECURITY & EVENT LOGGING **12**

Integrating Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM system – Setting up audit logging in hadoop cluster

Total: 60 Hours

COURSE OUTCOME:

The student will be able to:

CO1.Understand the significance of privacy, ethics in big data environment

CO2.Analyze the steps to secure big data and Build security in Hadoop environment and its ecosystem

CO3.Creating configuration for Hadoop ecosystem components

CO4.Analyze data security and event logging

CO5.Analyze the steps to secure big data

TEXT BOOK:

1. Frank Ohlhorst John Wiley & Sons, “Big Data Analytics: Turning Big Data into Big Money”, John Wiley & Sons, 2013.

REFERENCES:

1. Ben Spivey, Joey Echeverria, “Hadoop Security Protecting Your Big Data Problem”, O’Reilly Media, 2015.

21MES127 **DATA WAREHOUSING** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the need of data warehouses.
- To conceptualize the architecture of a data warehouse.
- To understand the data warehouse technologies.

UNIT I – INTRODUCTION **12**

The Data Warehouse - A Brief History, Characteristics, Operational Database Systems and Data Warehouse (OLTP & OLAP), Data Warehouses – Transaction Databases –Object Oriented Databases – Spatial Databases – Temporal Databases – Text And Multimedia Databases

UNIT II - DATA PROCESSING **12**

Data Cleaning, Integration and Transformation, Reduction, Discretization and concept hierarchy generation.

UNIT III - DATAWAREHOUSE **12**

Principles of Data Warehousing (Architecture and Design Techniques):System Processes, Data Warehousing Components, Architecture for a warehouse, Three tier Data Warehouse Architecture, Steps for the design and construction of Data Warehouses, Conceptual Data Architecture, Logical Architectures, Design Techniques.

UNIT IV - DATA INTEGRATION **12**

Data Integration and Transformation, Data Reduction, Data Warehouse and OLAP Technology for Data Mining: data warehouse, operational database systems and data warehouses, Architecture, Implementation, development of data cube technology, data warehousing to data mining, Data warehouse usage.

UNIT V-ETL PROCESS **12**

Steps of the ETL process- working of ETL process – ETL implementation and testing challenges- ETL vs data integration- continuous data integration

TOTAL:60 hours

COURSE OUTCOMES:

The student will be able to:

CO1.Understand the Data processing concepts in data warehousing

CO2.Illustrate the Steps for the design and construction of Data Warehouses

CO3.Development and use of data warehouse and data integration techniques to support data analytics

CO4.To apply Steps of the ETL process

CO5.Evaluate and explore on the data processing techniques

TEXT BOOKS

1. Krzysztof J. Cios, WitoldPedrycz, Roman W. Swiniarski, *"Data mining: a knowledge discovery approach"*, Springer, 2007

2. Berson, "*Data Warehousing, Data Mining, &Olap",* Tata McGraw-HillEducation, 2004

REFERENCES:

1. Alex Berson And Stephen J.Smith, "Data Warehousing, Data Mining And OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.

2. Jiawei Han And Micheline Kamber, "Data Mining Concepts And Techniques", Third Edition, Elsevier, 2012.

21MES128 IOT ARCHITECTURE AND PROTOCOLS 3 1 0 4

COURSE OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

UNIT I INTRODUCTION TO IoT 12

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE 12

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III IoT PROTOCOLS 12

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO 12

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS 12

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

TOTAL:60 Hours

COURSE OUTCOMES:

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

CO1.Analyze various protocols for IoT

CO2.Develop web services to access/control IoT devices.

CO3.Design a portable IoT using Rasperry Pi

CO4.Deploy an IoT application and connect to the cloud.

CO5.Analyze applications of IoT in real time scenario

TEXT BOOK

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach||, Universities Press, 2015

REFERENCES

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things||, Springer, 2011.

2. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective||, CRC Press, 2012.

3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.

4. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols||, Wiley, 2012

21MES129 **DEEP LEARNING** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce the fundamental techniques and principles of Neural Networks
- To study the different models in ANN and their applications
- To familiarize deep learning concepts with Convolutional Neural Network case studies

UNIT I NEURAL NETWORK 12

Mechanics of Machine Learning-Neuron-Linear Perceptron-Feed-Forward Neural Networks-Sigmoid, Tanh, and ReLU Neurons- Training Feed-Forward Neural Networks-Fast-Food Problem-Gradient DescentDelta Rule and Learning Rates.

UNIT II CONVOLUTIONAL NEURAL NETWORKS 12

TensorFlow: Creating and Manipulating TensorFlow Variables-TensorFlow Operations-Neurons in Human Vision-Convolutional Layer-Building a Convolutional Network-Visualizing Learning in Convolutional Networks-Learning Lower Dimensional Representations- Principal Component Analysis- Autoencoder Architecture- Implementing an Autoencoder in TensorFlow.

UNIT III RECURRENT NEURAL NETWORKS 12

Recurrent Neural Networks- Challenges with Vanishing Gradients- Long Short-Term Memory (LSTM) Units-TensorFlow Primitives for RNN Models- Implementing a Sentiment Analysis Model- Solving seq2seq Tasks with Recurrent Neural Networks-Memory Augmented Neural Networks:Neural Turing Machines, Attention-Based Memory Access, Differentiable neural Computers (DNC) -Memory Reuse - Temporal Linking - DNCController Network – Visualizing – Implementing the DNC in TensorFlow.

UNIT IV DEEP REINFORCEMENT LEARNING 12

Deep Reinforcement Learning - Masters Atari Games-Markov Decision Processes-Policy Versus Value Learning, Pole-Cart with Policy Gradients-Q-Learning and Deep RecurrentvQ-Networks.

UNIT V APPLICATIONS 12

Applications in Object Recognition and Computer Vision- Unsupervised or generative feature learningSupervised feature learning and classification- Applications in Multimodal and Multi-task Learning- Multimodalities: Text and image-Speech and image- Multi-task learning within the speech, NLP or image domain

TOTAL:60 hours

COURSE OUTCOMES:

At the end of this course, the Student will be able to

CO1.Design a simple Neural Networks using Linear Perceptron.

CO2.Implement a Convolutional Neural Networks using TensorFlow.

CO3.Develop an application based on Recurrent Neural Network.

CO4.Solve the Deep Reinforcement Learning problem.

CO5.Build the Speech and Text applications based deep neural network.

TEXT BOOKS

1. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.

2. Li Deng and Dong Yu "Deep Learning Methods and Applications", Foundations and Trends in Signal Processing, 2013. http://link.springer.com/openurl?genre=book&isbn=978-3-319-73004-2

REFERENCES

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, ”Deep Learning (Adaptive Computation and Machine Learning series”, MIT Press, 2017.
2. SandroSkansi“Introduction to Deep Learning From Logical Calculus to Artificial Intelligence”Springer, 2018.
3. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

WEBLINKS

https://www.oreilly.com/ai/free/files/fundamentals-of-deep-learning-sampler.pdf

21MES130 BLOCKCHAIN AND CRYPTOCURRENCY TECHNOLOGIES 3 1 0 4

COURSE OBJECTIVES:

- To understand the mechanism of Blockchain and Cryptocurrency.
- To understand the functionality of current implementation of blockchain technology.
- To understand the required cryptographic background.
- To explore the applications of Blockchain to cryptocurrencies and understanding limitations of current Blockchain.
- An exposure towards recent research.

UNIT I Introduction to Cryptography and Cryptocurrencies 12

Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.

UNIT II Block Chain Storage Techniques 12

Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

UNIT III Mechanics of Bitcoin Mining and Anonymity 12

Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements. The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies. Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash

UNIT IV Community, Politics, and Regulation 12

Consensus in Bitcoin, Bitcoin Core Software, Stakeholders: Who's in Charge, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation, New York's Bit License Proposal. Bitcoin as a Platform: Bitcoin as an Append only Log, Bitcoins as Smart Property, Secure Multi Party Lotteries in Bitcoin, Bitcoin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds

UNIT V Altcoins and the Cryptocurrency Ecosystem 12

Altcoins: History and Motivation, A Few Altcoins in Detail, Relationship Between Bitcoin and Altcoins, Merge Mining-Atomic Crosschain Swaps-6 BitcoinBacked Altcoins, Side Chains, Ethereum and Smart Contracts , Recent Trends

TOTAL:60 hours

COURSE OUTCOMES:

At the end of this course, the Student will be able to

CO1.To Understand and apply the fundamentals of Cryptography in Cryptocurrency

CO2.To gain knowledge about various operations associated with the life cycle of Blockchain and Cryptocurrency

CO3.To deal with the methods for verification and validation of Bitcoin transactions

CO4.To demonstrate the general ecosystem of several Cryptocurrency

CO5.To educate the principles, practices and policies associated Bitcoin business

TEXT BOOKS

1.Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. (2016). Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press.

REFERENCES

1. Antonopoulos, A. M. (2014). Mastering Bitcoin: unlocking digital cryptocurrencies. OReilly Media, Inc.

2. Franco, P. (2014). Understanding Bitcoin: Cryptography, engineering and economics. John Wiley and Sons

21MES131 DATA CENTER NETWORKS 3 1 0 4

COURSE OBJECTIVES:

- To provide the knowledge on Data center networks and Virtualization
- To impart the knowledge on High performance computing

UNIT I DATA CENTER EVOLUTION AND SWITCH FABRICS 12

Networking Basics - Cloud Data Centers and Cloud Networking Characteristics - Mainframes and Servers - Enterprise Cloud and Virtualized Data Centers - Movement to Cloud - Switch Fabric Architecture - Switch Fabric Congestion Management and Flow Control - Switch Fabric Traffic Management - Switch Chip Architecture

UNIT II CLOUD DATA CENTER NETWORKING AND STANDARDS 12

Traditional Multi-tiered Enterprise Networks - Data Center Network Switch Types - Flat Data Center Networks - Rack Scale Architectures - Network Function Virtualization - Ethernet Data Rate Standards - Data Center Bridging - Improving Network Bandwidth - Remote Direct Memory Access

UNIT III VIRTUALIZATION AND NETWORKING 12

Virtual Machines - Virtual Switching - PCI Express and Edge Virtual Bridging - VM Migration - Multi-tenant Environments - Traditional Network Tunneling Protocols - VXLAN and NVGRE Protocols - Tunnel Locations - Load Balancing Algorithms

UNIT IV SOFTWARE-DEFINED STORAGE AND NETWORKING 12

Conventional Storages - Advanced Storage Technologies - Storage Communication Protocols - Software-Defined Storage - Storage in Cloud Data Centers - Data Center Software - OpenStack and OpenFlow - Network Function Virtualization - SDN Deployment

UNIT V HIGH-PERFORMANCE COMPUTING AND TRENDS 12

HPC System Architectures - Multi-socket CPU Boards - HPC Networking Standards - HPC Network Performance Factors - HPC Networking Software - Rack Scale Architectures - Memory and Cabling Technology - Switch Fabric Technology - Software-Defined Infrastructure

TOTAL- 60 Hours

COURSE OUTCOMES:

At the end of this course, the Student will be able to

CO1.To understand the cloud data centers and switch fabric architecture.

CO2.To gain the knowledge of data center network switch types

CO3.To demonstrate the virtual machines ,VM migration and Protocols.

CO4.To describe the concepts software defined storage and Network function virtualization.

CO5.To understand the concepts high performance computing networks.

TEXT BOOKS

1. "Cloud Networking - Understanding Cloud-based Data Center Networks", Gary Lee, Elsevier, 2014

REFERENCES

1. "NX-OS and Cisco Nexus Switching: Next-Generation Data Center Architectures" , Kevin Corbin, Ron Fuller, David Jansen, Cisco Press; 1 edition [ISBN: 9781587058929], 2010.

2. Computer Networks – a system approach – Larry L. Peterson, Bruce S. Davie, 2/e,2007,Harcourt Asia PTE LTD.

3. Internetworking Technologies Handbook, Inc. Cisco Systems, ILSG Cisco

21MES131 **DATA SCIENCE WITH PYTHON** **3 1 0 4**

COURSE OBJECTIVES:

- To provide computational environments for data scientists using python.
- To includes the ndarray for efficient storage and manipulation of dense data arrays in python
- To features the dataframe for efficient storage and manipulation of labeled/columnar data in python
- To make decisions using applied and practical machine learning techniques.
- To learn the efficient and clean Python implementations of the most important and established machine learning algorithms

UNIT I IPYTHON: BEYOND NORMAL PYTHON **12**

Shell Or Notebook - Ipython Shell - Ipython Magic Commands - Input And Output History - Ipython And Shell Commands – Shell Related Magic Commands - Errors And Debugging - Profiling And Timing Code.

UNIT II INTRODUCTION TO NUMPY **12**

Understanding Data Types - The Basics Of Numpy Arrays - Computation On Numpy Arrays -Universal Functions – Aggregations - Min, Max,computation On Arrays: Broadcasting - Comparisons, Masks, And Boolean Logic - Fancy Indexing - Sorting Arrays - Structured Data: Numpy's Structured Arrays.

UNIT III DATA MANIPULATION WITH PANDA **12**

Installing And Using Pandas - Introducing Pandas Objects - Data Indexing And Selection - Operating On Data In Pandas - Handling Missing Data - Hierarchical Indexing - Combining Datasets: Concat And Append - Combining Datasets: Merge And Join - Aggregation And Grouping - Pivot Tables - Vectorized String Operations - Working With Time Series - High-Performance Pandas: Eval() And Query()

UNIT IV VISUALIZATION WITH MATPLOTLIB **12**

. General Matplotlib Tips - Two Interfaces For The Price Of One - Simple Line Plots - Simple Scatter Plots - Visualizing Errors - Density And Contour Plots -Histograms, Binnings, And Density - Customizing Plot Legends - Customizing Colorbars - Multiple Subplots - Text And Annotation - Customizing Ticks -Customizing Matplotlib: Configurations And Stylesheets - Three-Dimensional Plotting In Matplotlib - Geographic Data With Basemap - Visualization With Seaborn.

UNIT V MACHINE LEARNING **12**

Machine Learning - Introducing Scikit-Learn - Hyperparameters And Model Validation - Feature Engineering - Naive Bayes Classification - Linear Regression - Support Vector Machines -Manifold Learning - K-Means Clustering - Gaussian Mixture Models.

TOTAL: 60 Hours

COURSE OUTCOMES :

Students to complete this course will be able to

CO1.Perform powerful libraries for Machine learning applications and other scientific computations

CO2.Describe about numpy and deal with feature like linear algebra, fourier transforms and advanced random number capabilities.

CO3.Implement the pandas help us with munging and preparing data and also it is great for operating on and maintaining structured data,manipulating, transforming, and cleaning data

CO4.Apply the matplotlib will let you plot different kinds of graphs and visualizing different types of data

CO5.Describe the concepts and model of machine learning

TEXT BOOK

1. Jake VanderPlas, "Python Data Science Handbook"Jake. Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol,Copyright © 2017, ISBN-13:978-1491912050.

REFERENCES:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016, ISBN-13:978-1491939369

21MES133 INTELLIGENT OPTIMIZATION TECHNIQUES 3 1 0 4

COURSE OBJECTIVES:

- To impart in-depth knowledge on different advanced optimization techniques to solve engineering problems.
- To impart the concept of multi-objective optimization and its applications to real world problems.

Unit I FUNDAMENTALS OF OPTIMIZATION 12

Definition - Classification of optimization problems - Unconstrained and Constrained optimization - Optimality conditions - Classical Optimization techniques - Linear and non - linear programming - Quadratic programming - Mixed integer programming - Intelligent Search methods - Evolutionary algorithms - Tabu search - Particle swarm optimization – Advantages of intelligent techniques over classical optimization techniques

Unit II EVOLUTIONARY COMPUTATION TECHNIQUES 12

Evolution in nature - Fundamentals of Evolutionary algorithms - Principle of Genetic Algorithm - Evolutionary Strategy and Evolutionary Programming - Genetic Operators - Selection, Crossover and Mutation - Issues in GA implementation - Differential Evolution technique.

Unit III PARTICLE SWARM OPTIMIZATION 12

Fundamental principle - Velocity Updation - Parameter selection- hybrid approaches - hybrid of GA and PSO - hybrid of EP and PSO - Binary, discrete and combinatorial PSO - Implementation issues - Convergence issues – Fly Bee Algorithm.

Unit IV ADDITIONAL OPTIMIZATION METHODS 12

Simulated annealing algorithm - Tabu search algorithm - Ant colony optimization - Bacteria Foraging optimization - Artificial immune system.

Unit V MULTI OBJECTIVE OPTIMIZATION 12

Concept of pareto optimality - Conventional approaches for MOO - Weighted Sum and Constrained methods - Multi objective GA - Fitness assignment - Multi-objective PSO -Dynamic neighbourhood PSO - Vector evaluated PSO – Necessity for multi-criteria decision making.

TOTAL: 60 Hours

COURSE OUTCOMES:

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

CO1.Familiarize with the basic concept of optimization techniques.

CO2.Apply Genetic Algorithm for solving engineering problems.

CO3.Apply Swarm Optimization techniques for solving engineering problems.

CO4.Explain the concept of different advanced optimization techniques and their applications.

CO5.Explain the concept of Multi-objective optimization and apply it for solving real world problems.

TEXT BOOK

1. Kalyanmoy Deb, “Optimization for Engineering Design - Algorithms and Examples”, Prentice Hall of India, 1995.

2. David Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, Reading, 1989.

REFERENCES:

1. Kwang Y.Lee, Mohammed A.El Sharkawi, “Modern heuristic optimization techniques”, John Wiley and Sons, 2008.

2. Kalyanmoy Deb, “Multi objective optimization using Evolutionary Algorithms”, John Wiley and Sons, 2008.

3. Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen, “Evolutionary Algorithms for solving Multi Objective Problems”, 2nd Edition, Springer, 2007

21MES134 ADVANCED CRYPTOGRAPHY TECHNIQUES 3 1 0 4

COURSE OBJECTIVES:

To impart knowledge on

- To introduce the zero knowledge proofs and their variations
- To study about concurrent zero knowledge proofs
- To exemplify two-party secure computation and applications
- To study secure multiparty computation and protocol composition
- To cryptanalyze RSA and its variants and study chosen cipher text secure public key cryptosystem

Unit I ZERO KNOWLEDGE PROOFS 12

Review of Cryptographic techniques - Introduction to Zero Knowledge-Introduction to Concurrent Zero-Knowledge, Basic and probabilistic notations - Computational Indistinguishability – Interactive Proofs - Witness Indistinguishability- Commitment Schemes - Zero knowledge in other Models

Unit II CONCURRENT ZERO KNOWLEDGE 12

Concurrent Zero Knowledge (cZK) Proof Systems for NP - cZK in logarithmically many rounds - Black-Box cZK in logarithmically many rounds

Unit III TWO PARTY SECURE COMPUTATION 12

Security in the presence of Semi-honest adversaries, Malicious adversaries and Covert Adversaries – General versus Restricted functionalities – Sigma Protocols and Efficient Zero Knowledge-Search problems: Secure Database search, Secure Document Search, Secure Text Search - The kth-Ranked Element: Computing the Median – Semi-honest, Malicious

Unit IV MULTI PARTY SECURE COMPUTATION 12

Secure multi-party computation-Protocol composition-The composition of authenticated Byzantine agreement -Secure computation without agreement

Unit V UNIVERSALLY COMPOSABLE MULTIPARTY COMPUTATION 12

Universally Composable Multiparty computation: Overview, Two-Party Secure Computation for Semi-Honest Adversaries and Malicious Adversaries, Universally Composable Zero-Knowledge.

TOTAL: 60 Hours

COURSE OUTCOMES:

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

CO1.Emphasizes on how to apply and implement cryptography in practice.

CO2.Analyze the fundamental principles and theories underlying cryptographic algorithms, including the mathematical foundations of cryptography

CO3.Illustrates a broad view of security with practical applications of cryptography to data security

CO4.Analyses on various network security applications, IPSec, Firewall, IDS, Web security, Email security and malicious software

CO5.Ability to take up doctoral level research work in security.

TEXT BOOK:

1. Alon Rosen, "Concurrent Zero knowledge", Springer, 2006.

2. Carmit Hazay, Yehuda Lindell, "Efficient Secure Two-Party Protocols: Techniques and Constructions",

REFERENCES

1. Yehuda Lindell, "Composition of Secure Multi-Party Protocols: A Comprehensive Study", Lecture Notes in Computer Science, LNCS2815, Springer, 2003.

2. M.Jason Hinek," Cryptanalysis of RSA and Its Variants", Chapman Hall &CRC, 2010.

21MES135 DATA ANALYTICS 3 1 0 4

COURSE OBJECTIVES:

- To familiarize the basic data analytic techniques.
- To provide descriptive statistics on various scales.
- To visualize and summarize the data.
- To find natural groups and frequent patterns in dataset.
- To explore the predictive tasks, classification and regression.
- To provide applications of data analytics on sensitive fields.

UNIT I INTRODUCTION TO DATA **12**

Data – Small data – Big data – Big data architectures –Big data and data science – Data analytics – KDD Process – The CRISP – DM Methodology.

UNITII DESCRIPTIVE STATISTICS **12**

Scale types – Descriptive Uni-variate analysis – Descriptive Bi variate analysis – Descriptive multi variate analysis – Location and Dispersion multivariate statistics – Infographics and Word Clouds.

UNIT III PREPROCESSING DATA AND CLUSTERING **12**

Data Quality – Missing values – Redundant data – Inconsistent data – Noisy data – Data transformation – Principal and Independent Component Analysis – Independent Component Analysis – Attribute selection – Filters – Wrappers – Embedded – Clustering - Distance measures – Clustering techniques – Kmeans

UNIT IV PATTERN MINING AND PREDICTING THE UNKONWN **12**

Frequent pattern mining – Apriori join based method – FP Growth – Association rules – Simpson's Paradox – Types of pattern – Predicting the unknown - Regression – Classification – Predictive methods.

UNIT V APPLICATIONS **12**

Applications for Text, Web and Social media – Military applications of data analytics – Data analytics in government: current practices and future opportunities.

TOTAL: 60 Hours

COURSE OUTCOMES:

Students to complete this course will be able to

CO1.Optimize business decisions and create competitive advantage with Big Data analytics

CO2.Explore the fundamental concepts of big data analytics

CO3.Analyze the big data using intelligent techniques

CO4.Articulate the programming aspects of cloud computing and analytical aspects of Big Data

CO5.Understand the specialized aspects of big data including big data application, and big data analytics

TEXT BOOK

1. João Moreira, Andre Carvalho, Tomás Horvath, "A General Introduction to Data Analytics", 1st Edition, John Wiley & Sons, 2018.

2. Herbert Jones, "Data Analytics: An Essential Beginners Guide to Data Mining, Data Collection, Big Data Analytics for Business, and Business Intelligence Concepts",1st Edition, CreateSpace Independent Publishing Platform,2018.

REFERENCES:

1. Soraya Sedkaoui, "Data Analytics and Big Data",1st Edition, John Wiley & Sons, 2018.

2. Kevin Huggins, "Military Applications of Data AnalyticsData Analytics Applications",1stEdition, CRC Press, 2018.

3. Gregory Richards, "Big Data and Analytics Applications in Government: Current Practices and Future OpportunitiesData Analytics Applications", 1st Edition, CRC Press, 2017.

21MES136 APPLIED CRYPTOGRAPHY AND NETWORK SECURITY 3 1 0 4

COURSE OBJECTIVES:

The student should

- have a theoretical understanding of the principles underlying cryptography and cryptanalysis.
- have a fundamental understanding of symmetric and asymmetric encryption, hashing, and digital signatures.
- learn the basic concepts in networking and wireless security, applied cryptography, as well as ethical, legal, social and economic facets of security.
- be able to evaluate the security of communication systems, networks and protocols based on a multitude of security metrics.

UNIT I CRYPTOGRAPHY AND ENCRYPTION TECHNIQUES 12

Overview – Principles-Concepts –Symmetric and Asymmetric Encryption–AES – Block Cipher Operations– RSA Algorithm – Diffie Hellman Key Exchange.

UNIT II DATA INTEGRITY ALGORITHMS AND MUTUAL TRUST 12

Hash Functions – SHA – Message Authentication Codes – Digital Signatures- Key Management and Distribution – X.509 Certificates – Kerberos.

UNIT III NETWORK SECURITY 12

Vulnerabilities - Security Assessment, Analysis, and Assurance-Disaster Management – Access Control and Authentication – Authorization.

UNIT IV WIRELESS NETWORK SECURITY 12

.Wireless Security – Wireless LAN - Smart Phones – PDA – Bluetooth- Broadband Security

UNIT V SECURITY IN EMERGING TECHNOLOGIES 12

Next Generation Mobile Networks – Wireless Sensor Networks – Adhoc Networks – IP based Mobile Networks

Total Hours – 45

COURSE OUTCOMES :

Students who complete this course should

CO1.Analyse the vulnerabilities in any computing system and hence be able to design a security solution

CO2.Identify the security issues in the network and resolve it

CO3.Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.

CO4.Demonstrate various network security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software

CO5.Ability to take up doctoral level research work in security

TEXT BOOKS

1. William Stallings, "Cryptography and Network Security – Principles and Practice" 7th Edition, Pearson Education, ISBN No. 978- 0134444284,2016.

2. Joseph MiggaKizza, " Guide to Computer Network Security" 3rd Edition, Springer Publishers, ISBN No 978-1447166535,2015.

REFERENCES:

1. Wolfgang Osterhage, " Wireless Security", CRC Press, ISBN No. 978-1578087686,2011.

2. William Stallings, "Network Security Essentials, Applications and Standards",5thEdition, Pearson Education, ISBN No.978-0133370430,2013.

3. John R.Vacca , "Network and System Security",2nd Edition, Elsevier Publishers, ISBN No.978-0124166899,2014.

21MES137 ARTIFICIAL NEURAL NETWORKS 3 1 0 4

COURSE OBJECTIVES:

To impart knowledge on

- To explore the architecture and learning principles of Neural Networks.
- To develop the various hybrid algorithms involved in Neural Networks.
- To provide adequate knowledge of application of Neural Networks to real time systems.

Unit I ARTIFICIAL NEURAL NETWORKS 12

Biological Neurons and Neural Networks, Basic Structures and Properties of Artificial NeuralNetworks, Basic Neuron Models-McCulloch-Pitts –Different Activation Functions,Singe Layer Perceptrons-Linear Seperability, Single Layer Perceptron Architecture-Learning rule, Algorithm, Applications.

Unit II BACK PROPAGATION NEURAL NETWORKS 12

Multi-Layer Perceptron -Architecture, activation functions, Learning, Back PropagationAlgorithm – Practical considerations - Limitations–Network Paralysis, Local Minima, Temporal Instability – Deep learning- introduction, Networks Classes - Retrained Deep Neural Networks-Architecture, Learning Method- Application in object recognition.

Unit III NETWORK BASED ON COMPETITION 12

Fixed weight competitive Network-Maxnet, Mexican Hat and Hamming Net, Counter Propagation Networks-Kohonen's self-organizing map – Training the Kohonen layer – Training the Grossberg layer – Full counter propagation network – Application,Adaptive resonance theory – classification- Architecture – Learning and generalization.

Unit IV PATTERN ASSOCIATION 12

Training algorithm for pattern association - Hetro Associative Network, AutoAssociative Network, Architecture of Hopfield nets – stability analysis ,General Concepts ofAssociative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM training algorithms.

Unit V ADAPTIVE NETWORKS AND NEOCOGNITRON 12

Probablistic Neural networks : Introduction – architecture, Algorithm, Application, Analysis , Cascade correlation : Architecture, Learning Algorithm. Neocognitron : Architecture, Algorithm, Training process.

TOTAL: 60 Hours

COURSE OUTCOMES:

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

CO1.Apply Artificial Neural Network & Fuzzy Logic models to handle uncertainty and solve engineering problems.

CO2.Design and implement neural network systems to solve real world problems

CO3.Understand how neural networks fit into the more general framework of machine learning, and what their limitations and advantages are in this context.

CO4.Develop different single layer/multiple layer Perception learning algorithms

CO5.Solve real world problems using Associate Neural Network techniques.

TEXT BOOK:

1. Laurence Fausett, "Fundamentals of Neural Networks, Architecture, Algorithm and Applications", Prentice Hall, Third Edition, 2015.

2. Timothy J.Ross, "Fuzzy Logic Engineering Applications", McGrawHill,New York, Third Edition, 2010.

REFERENCES

3. S.Rajasekaran and G.A.VijayalakshmiPai "Neural networks, Fuzzy logics, and Genetic algorithms", Prentice Hall of India, First Edition, 2013.

4. Jang J.S.R., Sun C.T and Mizutani E, "Neuro Fuzzy and Soft computing"- A Computational Approach to Learning

21MES138 **ADVANCED GRAPH THEORY** **3 1 0 4**

COURSE OBJECTIVES:

To impart knowledge on

- To familiarize the students in the field of distance in graphs and its applications.
- To introduce types of digraphs and various matrix representations.
- To expose the students to flows in networks.
- To expose the students to various graphs in switching and coding theory.
- To introduce various domination in graphs and applications.

UNIT I DISTANCE IN GRAPHS **12**

The center of a graph - Distant vertices - Locating Numbers - Detour and Directed distance - Channel assignment

UNIT II DIRECTED GRAPHS **12**

Types of digraphs - Digraphs and binary relations - Directed paths and connectivity - Euler digraphs - Trees with directed edges - Fundamental circuits in digraphs - Matrices A,B and C of Digraph - Adjacency matrix of a Digraph.

UNIT III NETWORK FLOWS **12**

Cut sets - Some properties of a cut set - All cut sets in a graph - Fundamental circuits and cuts sets - Connectivity and separability Network flows - 1-Isomorphism - 2-Isomorphism.

UNIT IV GRAPHS IN SWITCHING AND CODING THEORY **12**

Flows and cuts - contact Networks-Analysis of contact Networks - Synthesis of contact networks - Sequential switching Networks - Unit Cube and its graph - Graphs in Coding Theory.

UNIT V DOMINATION IN GRAPHS **12**

Dominating set – The domination number of a graph – Independent domination number, Total domination number, connected domination number and Total connected domination number - Edge domination number, Connected edge domination number and connected edge domination number. Applications of Domination.

TOTAL: 60 Hours

COURSE OUTCOMES:

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

CO1.To understand and apply the fundamental concepts in graph theory

CO2.To apply graph theory based tools in solving practical problems

CO3.To improve the proof writing skills.

CO4.To formulate and prove fundamental theorems on trees, matchings, connectivity, colorings, plane and hamiltonian graphs

CO5.To understand the concept of plane graph and theory.

TEXT BOOK

1. Gary Chartrand, Ping Zhang, “Introduction to Graph Theory”, Tata McGraw-Hill Publishing company Limited, New Delhi, 2017.

2. Narsingh Deo “Graph Theory with Applications to Engineering and Computer science”, Prentice-Hall of India Private Limited, New Delhi, 2016.

REFERENCES

1. V.R.Kulli, ”Theory of Domination in Graphs”, Vishwa international publications, Gulbarga, India, 2010.

2. Fred Buckley, Frank Harary “Distance in Graphs”, Addison-Wesley Publishing company, 1990

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21MES139 BIO-INSPIRED COMPUTING 3 1 0 4

COURSE OBJECTIVES:

1. To understand the fundamentals of evolutionary theory and cellular automata.
2. To learn the artificial neural systems and swarm optimization for feature selection.
3. To learn the genetic algorithm and hybridization with memetic algorithms.

UNIT I INTRODUCTION TO EVOLUTIONARY ALGORITHM 12

Evolutionary algorithm, components of evolutionary algorithm representation (definition of individuals), Evaluation function (Fitness function), Population, parent selection Mechanism, Variation Operators, Survivor Selection Mechanism (Replacement), Initialization, Termination Condition, evolutionary algorithm case study Cellular systems, cellular automata, modeling with cellular systems, other cellular systems, computation with cellular systems, artificial life: analysis and synthesis of cellular systems.

UNIT II NEURAL SYSTEMS 12

Biological nervous systems, artificial neural networks, neuron models, architecture, signal encoding ,synaptic plasticity, unsupervised learning, supervised learning, reinforcement learning, evolution of neural networks, hybrid neural systems, case study.

UNIT III DEVELOPMENTAL AND IMMUNE SYSTEMS 12

Rewriting system, synthesis of developmental system, evolutionary rewriting systems, evolutionary developmental programs, biological immune systems, lessons for artificial immune systems,algorithms and applications, shape space, negative selection algorithm, clonal selection algorithm.

UNIT IV BEHAVIORAL SYSTEMS AND GENETIC ALGORITHMS 12

Behavior is cognitive science, behavior in AI, behavior based robotics, biological inspiration for robots, robots as biological models, robot learning, evolution of behavioral systems, learning in behavioral systems, co-evolution of body and control, towards self-reproduction, simulation and reality. Representation of Individuals, Mutation, Recombination, Population Models, Parent Selection, Survivor Selection, Example Application: Solving a Job Shop Scheduling Problem.

UNIT V HYBRIDIZATION WITH OTHER TECHNIQUES: MEMETIC ALGORITHMS AND COLLECTIVE SYSTEMS 12

Introduction to Local Search, Lamarckianism and the Baldwin Effect, Structure of a Memetic Algorithm, Heuristic or Intelligent Initialization, Hybridization within Variation Operators : Intelligent Crossover and Mutation, Local Search Acting on the output from Variation Operators ,Hybridization During the Genotype to Phenotype Mapping, Design Issues for Memetic Algorithms. Biological self-organization, Particle Swarm Optimization (PSO), ant colony optimization (ACO), swarm robotics, co-evolutionary dynamics, artificial evolution of competing systems,artificial evolution of cooperation, case study.

Total: 60 hours

COURSE OUTCOMES

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

CO1.An overview of algorithms that can be used for autonomous design and adaptation of intelligent systems.

CO2.Insight is biologically inspired as well as traditional machine learning methods for search, optimization and classification.

CO3.An overview of the benefits and drawbacks of the various methods.

CO4.Knowledge of using the methods for real-world applications.

CO5.Practical assignments with experience being achieved from both using tools as well as coding your own algorithm

TEXT BOOKS

1. D. Floreano and C. Mattiussi, "Bio-Inspired Artificial Intelligence", MIT Press, 2008.
2. Tao Song, Pan Zheng, Mou Ling Dennis Wong, Xun Wang, “Bio-Inspired Computing Models and Algorithms”, ISBN: 978-981-3143-19-7, world scientific, 2019
3. F. Neumann and C. Witt, “Bioinspired Computation in combinatorial optimization:Algorithms and their

REFERENCES

1. D. E. Goldberg, “Genetic algorithms in search, optimization, and machine learning”, Addison- Wesley, 1989.
2. Simon O. Haykin, “Neural Networks and Learning Machines”, Third Edition, Prentice Hall,2008.
3. M. Dorigo and T. Stutzle, “Ant Colony Optimization”, A Bradford Book, 2004.
4. R. C. Ebelhart, “Swarm Intelligence”, Morgan Kaufmann, 2001.
5. Xin-She Yang,Zhihua Cui Renbin Xiao Amir HosseinGandomi Mehmet Karamanoglu “Swarm Intelligence and Bio-Inspired Computation”, 1st Edition, Elsevier, 2013.

21MES140 SENSING TECHNIQUES AND SENSORS 3 1 0 4

COURSE OBJECTIVES:

To impart knowledge on

- To gain knowledge on the sensor characteristics and the fundamental principles of sensing
- To learn the optical components of sensors and characteristics of interface electronic circuits
- To get acquainted with motion-related sensors
- To learn how to use flow sensors and light detectors
- To find out the importance of selected temperature and chemical sensors
-

UNIT I PRINCIPLES OF SENSING 12

Data acquisition – Sensor characteristics: Transfer function – Calibration – Accuracy – Calibration error -Nonlinearity – Saturation – Repeatability – Reliability – Uncertainty. Physical principles of sensing: electric charges, fields, potentials – capacitance – magnetism – resistance – piezoelectric effect – pyroelectric effect – Hall effect –thermoelectric effects – sound waves –Temperature and thermal properties of materials - heat transfer – light –dynamic models of sensor elements.

UNIT II OPTICAL COMPONENTS AND INTERFACE ELECTRONICS 12

Optical Components of sensors: Radiometry – Photometry – Windows - mirrors – lenses – Fresnel Lenses - fiber optics – concentrators. Interface electronic circuits: Input characteristics – amplifiers – light-to-voltage converters –Excitation circuits – Analog-to-Digital converters – Direct digitization – Capacitance-to-voltage converters – Bridge circuits – data transmission – noise in sensors and circuits – calibration – Batteries for low power sensors.

UNIT III MOTION RELATED SENSORS 12

Occupancy and motion detectors: Ultrasonic – microwave motion – capacitive occupancy – triboelectric – optoelectronic motion – optical presence sensors – Pressure-gradient sensors. Velocity and acceleration: Accelerometer characteristics – capacitive accelerometers – piezoresistive accelerometers – piezoelectric accelerometers – thermal accelerometers – Gyroscopes – piezoelectric cables – gravitational sensors.

UNIT IV FLOW SENSORS AND LIGHT DETECTORS 12

Flow sensors: Basics of flow dynamics - Pressure gradient technique - Ultrasonic - Electromagnetic - Breeze - Drag Force sensors - Dust and smoke detectors. Light Detectors: Photodiodes – phototransistor – photoresistors – Cooled detectors – Image sensors – Thermal detectors: Bolometers, Active far-infrared sensors – optical design – gas flame detectors.

UNIT V TEMPERATURE AND CHEMICAL SENSORS 12

Temperature Sensors: coupling with objects – temperature reference points – thermo resistive sensors –thermoelectric contact sensors – acoustic temperature sensors – piezoelectric temperature sensors. Chemical sensors: characteristics – classes of chemical sensors – biochemical sensors – multi sensor arrays – electronic noses and tongues. Humidity and moisture sensors.

Total : 60 hours

COURSE OUTCOMES:

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

CO1.To get the basic idea of measurements and the errors associated with measurement.

CO3.To gain information about the function of various measuring instruments and using them

CO4.To describe sensor manufacturing technologies

CO5.To apply international standards for particular sensors

TEXT BOOK:

1. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", Fourth Edition, Springer, 2010.

2. Ian Sinclair, "Sensors and Transducers", Third Edition, Elsevier, 2011.

REFERENCES:

1. John Vetelino and AravindReghu, "Introduction to sensors", CRC Press, 2011.

21MES141 ADVANCED COMPUTER ARCHITECTURE 3 1 0 4

COURSE OBJECTIVES*:*

- To provide students with a fundamental knowledge of computer hardware and computer systems, with an emphasis on system design and performance.
- To learn the principles of underlying systems organization, issues in computer system design, and implementations of modern systems.

UNIT I PIPELINING AND ILP 12

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 – Hardware based Speculation - Multiple Issue Processors – Thread Level Parallelism -Case Studies.

UNIT II ADVANCED TECHNIQUES FOR EXPLOITING ILP 12

Compiler Techniques for Exposing ILP - Limitations on ILP for Realizable Processors - Hardware versus Software Speculation mechanisms - Multithreading: Using ILP Support to Exploit Thread-level Parallelism - Performance and Efficiency in Advanced Multiple Issue Processors - Case Studies.

UNIT III MEMORY HIERARCHY DESIGN 12

Introduction - Optimizations of Cache Performance – Reducing cache Miss Penalty-Reducing Miss Rate –Main Memory and organization for improving performance - Memory Technology and Optimizations - Protection: Virtual Memory and caches – Virtual Machines - Design of Memory Hierarchies - Case Studies.

UNIT IV MULTIPROCESSORS 12

Introduction-Characteristics of Application Domains -Symmetric shared memory architectures – Cache coherence issues - Performance Issues –Distributed shared memory Architectures- Synchronization issues - Crosscutting Issues- – Models of Memory Consistency - Interconnection networks – Buses, crossbar and multi-stage switches.

UNIT V MULTI-CORE ARCHITECTURES 12

Software and hardware multithreading – SMT and CMP architectures – Performance Issues- Synchronization issues- Cache coherence issues- Models of Memory consistency- Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture.- hp architecture.

TOTAL:60 HOURS

COURSE OUTCOMES:

At the end of this course, the Student will be able to

CO1.To Demonstrate concepts of parallelism in hardware/software

CO2.To understand memory organization and mapping techniques.

CO3.To Describe architectural features of advanced processors.

CO4.To Interpret performance of different pipelined processors.

CO5.To Explain data flow in arithmetic algorithms

TEXT BOOKS

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann

2. David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture : A hardware/ software approach” , Morgan Kaufmann / Elsevier, 1997.(Unit V)

REFERENCES

1. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Pearson Education, Seventh Edition, 2006.

21MES142 OBJECT ORIENTED SYSTEMS ENGINEERING 3 1 0 4

COURSE OBJECTIVES:

- To understand the importance of object oriented software engineering.
- To study the various lifecycle models for developing software's.
- To analyze and design software using tools.
- To develop efficient software, deploy and maintain after production.

UNIT I CLASSICAL PARADIGM 12

System Design Concepts – Project Organization Concepts : Project Organizations , Roles , Tasks and Work Products ,Schedule – Project Communication concepts : Planned Communication , Unplanned Communication ,Communication Mechanism – Project Management Concepts : Tasks and Activities ,Work Products , Work Packages and Roles , Work Breakdown Structure ,Task Model ,Skill matrix

UNIT II PROCESS MODELS 12

Life cycle models: Sequential Activity Centered Models, Iterative Activity Centered models, Entity Centered models – Unified Process – Iterative and Incremental – Workflow – Agile Processes

UNIT III ANALYSIS 12

Requirements Elicitation Concepts – An Overview of Unified Modeling Language –Analysis Concepts : Analysis Object Model and Analysis Dynamic Models – Non-functional requirements – Analysis Patterns – Executable specification

UNIT IV DESIGN 12

System Design, Architecture – Design Principles - Design Patterns – Dynamic Object Modeling – Static Object Modeling – Model based approach vs Document based approach – Interface Specification – Object Constraint Language

UNIT V IMPLEMENTATION, DEPLOYMENT AND MAINTENANCE 12

Mapping Design (Models) to Code – Testing - Usability – Deployment – Configuration Management – Maintenance

TOTAL:60 HOURS

COURSE OUTCOMES:

At the end of this course, the Student will be able to

CO 1. Understand and describe the project principles and constructs of object-oriented system.

CO 2. Identify and model/represent domain constraints on the objects and (or) on their relationships

CO 3. Understand various modeling techniques to model different perspectives of object-oriented software design (UML)

CO 4. Analyze and understand Object Model and object constraint language.

CO 5. Recognize the knowledge about testing methods and maintenance deployment

TEXT BOOKS

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd edition, Pearson Education, 2004.
2. Craig Larman, Applying UML and Patterns 3rd edition, Pearson Education, 2005.

REFERENCES

1. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.
2. Ivar Jacobson, Grady Booch, James Rumbaugh, The Unified Software Development Process, Pearson Education, 1999.

21MES143 PARALLEL ALGORITHMS 3 1 0 4

COURSE OBJECTIVES:

- To study the different models of parallel computers
- To learn the different types of parallel computation
- To study the various parallel sorting and searching algorithms
- To understand the parallel algorithms for matrix and graph

UNIT I PARALLEL COMPUTERS 12

The demand for computational speed-Potential for increasing computational speed-Types of parallel computers: Shared memory 128 multiprocessor system-Message Passing multicomputer-Distributed shared memory-MIMD and SIMD classifications. Cluster Computing: Interconnected computers as a Cluster Configurations-Setting up a cluster.

UNIT II PARALLEL COMPUTATIONS 12

Ideal parallel computation-Parallel Examples: Geometrical transformation of images-Mandelbrotset - Monte-Carlo Methods - Pipelined Computations: Pipeline technique - Examples: Adding Numbers- Sorting Numbers- Prime Number Generation - Synchronization: Barrier- Counter- tree- butterfly - Synchronised computations: Data Parallel computation-Synchronous iteration - Examples

UNIT III SORTING AND SEARCHING 12

Issues in Sorting on Parallel Computers- Sorting Networks- Bubble Sort and its Variants- Quicksort- Bucket and Sample Sort- Other Sorting Algorithms-Enumeration Sort- Radix Sort- Sequential Search Algorithms-Parallel Depth First Search-Parallel Best-First Search

UNIT IV MATRIX AND GRAPH ALGORITHMS 12

Matrix Vector Multiplication:Rowwise 1D Partitioning-2D Partitioning - Matrix Matrix Multiplication:A Simple Parallel Algorithm- Cannon's Algorithm-The DNS Algorithm - Solving a System of Linear Equations:A Simple Gaussian Elimination Algorithm - Gaussian Elimination with Partial Pivoting - Solving a Triangular System: Back Substitution - Graph:Definitions and Representation - Minimum Spanning Tree: Prim's Algorithm - Single Source Shortest Paths: Dijkstra's Algorithm - All Pairs Shortest Paths-Transitive Closure-Connected Components-Algorithms for Sparse Graphs.

UNIT V DYNAMIC PROGRAMMING AND FAST FOURIER TRANSFORM 12

Dynamic Programming:Overview of Dynamic Programming(DP) - Serial Monadic DP Formulations: The Shortest Path Problem- The 0/1 Knapsack Problem - Nonserial Monadic DP Formulations: The Longest Common Subsequence Problem - DP Serial Polyadic Formulations: 129 Floyd's All Pairs Shortest Paths Algorithm - Nonserial Polyadic DP Formulations: The Optimal Matrix Parenthesization Problem - Fast Fourier Transform:The Serial Algorithm-The Binary Exchange AlgorithmThe Transpose Algorithm.

TOTAL: 60 hours

COURSE OUTCOME:

At the end of this course, the Student will be able to

CO 1. Understand the need for increase in computational speed of parallel computers

CO 2. Implement ideal parallel and pipelined computation according to the application

CO 3. Design and identify issues in sorting and searching algorithms for parallel computers

CO 4. Familiarize with the concepts of matrix and graph algorithm.

CO 5. understand and be able to apply dynamic programming and algorithmic design technique

TEXT BOOKS:

1. Barry Wilkinson,Michael Allen , “Parallel Programming: Techniques and Applications using networked workstations and Parallel Computers”,Pearson,Second edition,2005.
2. AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, “ Introduction to Parallel Computing”,Pearson, 2003.

REFERENCES:

1. Selim G. Akl, “The Design and Analysis of Parallel Algorithms”, Prentice Hall, New Jersey, 1989.
2. Michael J. Quinn, “Parallel Computing : Theory & Practice”, Tata McGraw Hill, 2003.
3. Justin R. Smith, “The Design and Analysis of Parallel Algorithms”, Oxford University Press, USA , 1993.
4. Joseph JaJa, “Introduction to Parallel Algorithms”, AddisonWesley, 1992.

21MES144 **MULTICORE ARCHITECTURES** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters.
- To understand the different multiprocessor issues.
- To expose the different types of multicore architectures.
- To understand the design of the memory hierarchy.
- To understand how the various forms of parallelism are exploited by the architecture.

UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND ILP **12**

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.

UNIT II MEMORY HIERARCHY DESIGN **12**

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT III MULTIPROCESSOR ISSUES **12**

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT IV MULTICORE ARCHITECTURES **12**

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP Architecture – IBM Cell Architecture. Introduction to Warehouse-Scale computers, Cloud Computing – Architectures and Issues – Case Studies.

UNIT V VECTOR, SIMD AND GPU ARCHITECTURES **12**

Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism – Introduction to Domain Specific Architectures.

TOTAL : 60 hours

COURSE OUTCOMES:

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

CO1.Analyze the fundamentals and advanced concepts of computer architecture

CO2.Identify the limitations of ILP and the need for multicore architecture

CO3.Address the issues related to multiprocessing and suggest solutions

CO4.Design a memory hierarchy and optimize it

CO5.Compare vector, SIMD and GPU architectures

TEXT BOOKS

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.

REFERENCES:

1. Darryl Gove, “Multicore Application Programming: For Windows, Linux, and Oracle Solaris”, Pearson, 2011.

2. David B. Kirk, Wen-mei W. Hwu, “Programming Massively Parallel Processors”, Morgan Kauffman, 2010.

3. Wen–mei W.Hwu,“GPU Computing Gems”, Morgan Kaufmann / Elsevier, 2011.

21MES145 **ADVANCED OPERATING SYSTEMS** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the concepts of distributed systems.
- To get an insight into the various issues and solutions in distributed operating systems.
- To learn about real-time operating systems.
- To gain knowledge on the design concepts of mobile operating systems.
- To understand cloud operating systems.

UNIT I INTRODUCTION **12**

Distributed Operating Systems – Issues – Communication Primitives – Limitations of a Distributed System – Lamport's Logical Clocks – Vector Clocks – Causal Ordering of Messages

UNIT II DISTRIBUTED OPERATING SYSTEMS **12**

Distributed Mutual Exclusion Algorithms – Classification – Preliminaries – Simple Solution – Lamport's Algorithm – Ricart-Agrawala Algorithm – Suzuki-Kasami's Broadcast Algorithm –Raymond's Tree-Based Algorithm – Distributed Deadlock Detection – Preliminaries – Centralized Deadlock Detection Algorithms – Distributed Deadlock Detection Algorithms – Path Pushing Algorithm – Edge Chasing Algorithm – Hierarchical Deadlock Detection Algorithms – Agreement Protocols – Classification – Solutions to the Byzantine Agreement Problem – Lamport- Shostak Pease Algorithm

UNIT III DISTRIBUTED RESOURCE MANAGEMENT **12**

Distributed File Systems – Design Issues – Google File System – Hadoop Distributed File System – Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Load Distributing Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol

UNIT IV REAL TIME OPERATING SYSTEMS **12**

Basic Model of Real - Time Systems – Characteristics – Application of Real - Time Systems – Real - Time Task Scheduling – Handling Resource Sharing

UNIT V MOBILE AND CLOUD OPERATING SYSTEMS **12**

Android – Overall Architecture – Linux Kernel – Hardware Support – Native User-Space – Dalvik and Android's Java – System Services – Introduction to Cloud Operating Systems.

TOTAL : 60 hours

COURSE OUTCOMES:

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

CO1.Apply the operating system concepts to a distributed environment and identify the features specific to distributed systems.

CO2.Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating systems.

CO3.Illustrate the different consistency model, replacement strategy in distributed shared memory.

CO4.Apply the distributed system concepts for any scenario.

CO5.Identify the role of operating systems in cloud and mobile environment.

TEXT BOOKS

1. Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems –Distributed, Database and Multiprocessor Operating Systems", Tata MC Graw-Hill, 2001.

REFERENCES:

1. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.

2. Karim Yaghmour, “Embedded Android”, O’Reilly, First Edition, 2013.

3. Nikolay Elenkov, “Android Security Internals: An In-Depth Guide to Android’s Security Architecture”, No Starch Press, 2014.

1MES146 PATTERN RECOGNITION TECHNIQUES 3 1 0 4

COURSE OBJECTIVES :

- To understand the concept of Pattern Recognition and Statistical Recognition.
- To Learn the unsupervised learning and clustering techniques to solve the problems.
- To gain the knowledge of syntactic and neural pattern recognition.

UNIT I – PATTERN RECOGNITION OVERVIEW 12

Pattern recognition, Classification and Description—Patterns and feature Extraction with Examples—Training and Learning in PR systems—Pattern recognition Approaches

UNIT II – STATISTICAL PATTERN RECOGNITION 12

Introduction to statistical Pattern Recognition—supervised Learning using Parametric and Non Parametric Approaches.

UNIT III LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING 12

Introduction—Discrete and binary Classification problems—Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems— Clustering for unsupervised learning and classification.

UNIT IV– SYNTACTIC PATTERN RECOGNITION 12

Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via grammatical inference.

UNIT V– NEURAL PATTERN RECOGNITION 12

Introduction to Neural networks—Feedforward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

TOTAL : 60 hours

COURSE OUTCOMES:

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

CO1.Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.

CO2.Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.

CO3.Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.

CO4.Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

CO5.Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

TEXT BOOKS

1. Robert Schalkoff, “Pattern Recognition: Statistical Structural and NeuralApproaches”, John wiley&sons , Inc,1992.

2. Earl Gose, Richard johnsonbaugh, Steve Jost, “Pattern Recognition and ImageAnalysis”, Prentice Hall of India,.Pvt Ltd, New Delhi, 1996.

REFERENCES

1. Duda R.O., P.E.Hart& D.G Stork, “ Pattern Classification”, 2nd Edition, J.WileyInc 2001.

2. Duda R.O.& Hart P.E., “Pattern Classification and Scene Analysis”, J.wileyInc, 1973.

3. Bishop C.M., “Neural Networks for Pattern Recognition”, Oxford University Press, 1995

21MES147 ADVANCED DATABASE TECHNOLOGY 3 1 0 4

COURSE OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the applications of Object-Oriented database
- To understand the principles of intelligent databases and usage of advanced data models.
- To learn emerging databases such as XML, Cloud and Big Data.

UNIT I PARALLEL AND DISTRIBUTED DATABASES 12

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 – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES 12

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 featuresinSQL/Oracle – Case Studies.

UNIT III XML DATABASES 12

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT IV MOBILE DATABASES 12

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

UNIT V MULTIMEDIA DATABASES 12

Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

TOTAL:60 hours

COURSE OUTCOMES:

Upon the successful completion of the course, students will be able to:
CO1.Develop skills on databases to optimize their performance in practice.

CO2.Analyze each type of databases and its necessity

CO3.Design faster algorithms in solving practical database problems

CO4.Analyze mobile databases and various transaction models.

CO5.Gain knowledge about multimedia databases and its applications.

TEXT BOOKS

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and

3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. V.S.Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt Ltd., 2001.

REFERENCES

1. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Vijay Kumar, “ Mobile Database Systems”, John Wiley & Sons, 2006.

Syllabus
Open Elective Courses

21MES151 **SPEECH PROCESSING** **3 1 0 4**

COURSE OBJECTIVES:

- To learn the key algorithms in speech processing (noisy channel model, hidden Markov model, n-gram language model, Viterbi decoding and search, unit selection synthesis, dialog modeling, and the roles of other linguistic knowledge).
- To understand the basic algorithms and to apply in various applications.

UNIT I INTRODUCTION **12**

Spoken Language System Architecture and Structure – Sound and Human Speech System – Phonetics and Phonology – Syllables and Words – Syntax and Semantics –Probability Theory – Estimation Theory – Significance Testing – Information theory – Pattern recognition: Baye's decision Theory – Discriminative training

UNIT II SPEECH SIGNAL REPRESENTATION AND CODING **12**

Short Time Fourier Analysis – Acoustic Model of Speech Production - Linear Predictive Coding – Cepstral Processing – Perceptual Motivated Representations – Formant Frequencies – Role of Pitch – Scalar Waveform Coders – Scalar Frequency Domain Coders – Code excited linear Prediction – Low – Bit rate Speech coders.

UNIT III SPEECH RECOGNITION **12**

Hidden Markov Models (HMM) – Practical Issues in Using HMMs – HMM Limitations Acoustic Modeling – Phonetic Modeling – Acoustic modeling – Acoustic features. Adaptive Techniques-Minimizing Mismatches. Confidence Measures: Measuring the Reliability.Language Modeling - Speaker Recognition Algorithms – Signal Enhancement for Mismatched Conditions.

UNIT IV SPEECH SYNTHESIS **12**

Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification Of Speech – Source Filter Models For Prosody Modification – Evaluation Of Text To Speech System. Text and Phonetic Analysis: Modules and Data Flow – Lexicon - Document Structured Detection - Text Normalization - Linguistic Analysis- Homograph Disambiguation.

UNIT V SPOKEN LANGUAGE UNDERSTANDING **12**

Dialog Structure – Semantic Representation – Sentence Interpretation – Discourse Analysis – Dialog Management – Response Generation And Rendition – Case Study. Applications and User Interfaces - Application Architecture. Typical Applications - Speech Interface Design – Internationalization - Case Study - MIPAD.

TOTAL: 60 Hours

COURSE OUTCOME:

CO1.design and implement algorithms for processing audio and speech signals using Matlab

CO2.understand the properties of speech signal representation and coding

CO3.execute speech recognition methods

CO4.estimate the effect of speech analysis and synthesis technologies

CO5.explain the main principles of spoken language

TEXT BOOKS

1. Thomas F.Quatieri, "Discrete-Time Speech Signal Processing", Pearson Education, 2002.
2. Xuedong Huang, Alex Acero, Hsiad, Wuen Hon, " Spoken Language Processing", Prentice Hall ,2001.

REFERENCES

1. B.Gold and N.Morgan, "Speech and Audio Signal Processing", Wiley and Sons, 2000.

2. M.R.Schroeder, “Computer Speech – Recognition, Compression, Synthesis”, Springer Series in Information Sciences, 1999.
3. Daniel Jurafsky & James H.Martin, “Speech and Language Processing”, Pearson Education ,2000.

WEBLINKS

1. A Brief Introduction to Speech Analysis and Recognition, An Internet Tutorial - http://www.mor.itesm.mx/~omayora/Tutorial/tutorial.html

21MES152 **BIO INFORMATICS** **3 1 0 4**

Course Objective:

- To understand the networks underlying biological functions of living systems.
- To know the computational methods of storing, retrieving, and analyzing of biological information as it passes from its storage sites (DNA/RNA) in the genome to the sites of synthesis of various gene products and structure-function relationships and their effects in the cells and the organisms.

UNIT I **INTRODUCTORY CONCEPTS** **12**

The Central Dogma – The Killer Application – Parallel Universes – Watson's Definition – Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership – Implementation – Management.

UNIT II **SEARCH ENGINES AND DATA VISUALIZATION** **12**

The search process – Search Engine Technology – Searching and Information Theory – Computational methods – Search Engines and Knowledge Management – Data Visualization – sequence visualization – structure visualization – user Interface – Animation Versus simulation – General Purpose Technologies.

UNIT III **STATISTICS AND DATA MINING** **12**

Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability – Approximation – Interface Noise – Assumptions – Sampling and Distributions – Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection statistics of Alignment – Clustering and Classification – Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools.

UNIT IV **PATTERN MATCHING** **12**

Pairwise 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.

UNIT V **MODELING AND SIMULATION** **12**

Drug Discovery – components – process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – AbInitio Methods – Heuristic methods – Systems Biology – Tools – Collaboration and Communications – standards - Issues – Security – Intellectual property.

TOTAL: 60 Hours

COURSE OUTCOME:

CO1.implement solutions to basic bioinformatics problems

CO2.discuss the use of bioinformatics in addressing a range of biological questions

CO3.use and describe some central bioinformatics data and information resources

CO4.discuss the technologies for pattern matching

CO5.describe how bioinformatics methods can be used to relate sequence, structure and function

TEXT BOOK

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.

REFERENCE BOOK

21MES153 **ASIC DESIGN** **3 1 0 4**

COURSE OBJECTIVES:

- To know about the various array based ASIC designs and its design flow.
- To learn the logic cells involved in construction and the technology behind it. To analyse the tool in design of VHDL and Verilog.
- To clearly understand the floor planning and routing and its associated algorithms and its boundary testing conditions.

UNIT I INTRODUCTION TO VLSI DESIGN 12

Introduction to ASICs – Types of ASICs –Gate-array-based ASICs: Channeled gate array – Channel less gate array – Structured gate array – PLD. Design Flow – Economics of ASICs - CMOS Transistors – CMOS process – CMOS design rules - Combinational logic cells - Sequential Logic Cells – Data path Logic Cells – I/O Cells – Cell Compilers.

UNIT II ASIC TECHNOLOGY 12

ASIC Library Design: Transistors as resistors – Transistor parasitic capacitance – Logical effort – Cell Design – Architecture – Gate array architecture – Standard cell design – Data path cell design - Moore's law - ASIC technology evaluation – Issues related to various technologies like 0.25µm, 0.18 µm, 90 nm, 65 nm, 45 nm.

UNIT III DESIGN AUTOMATION TOOLS 12

CAD For ASIC Design – Design Entry - VHDL/Verilog – 4-bit Multiplier – Packages and libraries – Interface declaration – Sequential statements – Netlist Extraction – Functional Simulation – Cell models – Delay models – Synthesis – Verilog and logic synthesis – STA – DFT – Formal verification – Layout, Placement, Floor Planning Routing.

UNIT IV ALGORITHMS 12

Techniques for Simulation – Synthesis: Hardware Models - Internal representation of the input Algorithm – Allocation - Assignment and Scheduling – Layout – Placement – Positioning – Floor planning: Placement – Physical design flow – Information formats – Routing: Global routing – Detailed routing – Special routing – Circuit extraction and DRC

UNIT V TESTING 12

Boundary-Scan Test – Faults - Testing for single Stuck Faults (SSF): Automated test pattern generation (ATPG/ATG) for SSFs - Vector Simulation - ATPG Vectors – Fault Simulation – Automatic Test-Pattern Generation – Scan Test - Generic Boundary scan - Full integrated scan - Storage cells for scan design – Built-in Self-Test – Applications of ASICs – Case studies.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Demonstrate VLSI tool-flow and appreciate FPGA architecture.

CO2.Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.

CO3.Physical design flow of IC : Floor-planning, Placement and Routing

CO4.Appreciate high performance algorithms available for ASIC construction

CO5.Appreciate research in VLSI testing, ATPG and ATPG Tools

TEXT BOOK

1. Michael John Smith Sebastian, "Application Specific Integrated Circuits", Addison Wesley, 1997.(1,2,3,4)

REFERENCES

1. S.H.Gerez, "Algorithms for VLSI Design Automation", John Wiley, 1998.(4)
2. Alfred L.Grouch, "Design for Test for Digital IC's and Embedded Core Systems, Volume 1",PH, 1999.(5)

21MES154 **EMBEDDED SYSTEMS** **3 1 0 4**

COURSE OBJECTIVES:

- To introduce the difference between embedded systems and general purpose systems.
- To introduce different peripheral interfaces to embedded systems.
- To understand the design tradeoffs made by different models of embedded systems.
- To apply knowledge gained in software-hardware integration in team-based projects.

UNIT I EMBEDDED COMPUTING 12

Challenges of Embedded Systems – Embedded system design process-Embedded processors –Typical embedded system -hardware unit- ARM processor and register set – Architecture, ARM branches and subroutines-ARM based system-Thumb Instruction sets.

UNIT II EMBEDDED C PROGRAMMING 12

Embedded c- c v/s embedded c-branching structures-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

UNIT III OPTIMIZING ASSEMBLY CODE 12

Profiling and cycle counting – instruction scheduling – Register allocation – conditional execution – looping constructs – bit manipulation – efficient switches – optimized primitives.

UNIT IV PROCESSES AND OPERATING SYSTEMS 12

Multiple tasks and processes -RTOS task scheduling models– Context switching-process control block – Scheduling policies –priority inversion problem and deadlock situations- Inter process communication mechanisms – Exception handling- interrupt handling - Performance issues.

UNIT V EMBEDDED SYSTEM DEVELOPMENT 12

Meeting real time constraints – Multi-state systems and function sequences-Exemplary embedded system- Embedded software development tools – Emulators and debuggers. Design methodologies – Case studies – Complete design of example embedded systems.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Develop an understanding of the technologies behind the embedded computing systems.

CO2.Understand hardware and software design requirements of embedded systems.

CO3.Analyze the embedded systems' specification and develop software programs.

CO4.Evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems.

CO5.Develop real time operating systems based embedded system

TEXT BOOKS

1. Andrew N Sloss, D. Symes, C. Wright, " ARM System Developers Guide", Morgan Kaufmann / Elsevier, 2006.

2. Michael J. Pont, "Embedded C", Pearson Education , 2007.

REFERENCES

1. Wayne Wolf, "Computers as Components : Principles of Embedded Computer System Design", Morgan Kaufmann / Elsevier, 2nd. edition, 2008.

2. Steve Heath, "Embedded System Design" , Elsevier, 2nd. edition, 2003.

21MES155 MOBILE AND PERVASIVE COMPUTING 3 1 0 4

COURSE OBJECTIVES:

- To learn the various wireless network technologies and the mobile computing environment.
- To know the conceptual, theoretical, and applicable aspects of pervasive computing.
- To understand the designs and applications of location and context-aware technologies.

UNIT I WIRELESS NETWORKS 12

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

UNIT II MOBILE COMPUTING ENVIRONMENT 12

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.

UNIT III LOCATION AND TRACKING MANAGEMENT 12

Handoff in wireless mobile networks-reference model-handoff schemes. Location management in cellular networks - Mobility models- location and tracking management schemes- time, movement ,profile and distance based update strategies. ALI technologies

UNIT IV PERVASIVE COMPUTING 12

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

UNIT V OPEN PROTOCOLS 12

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.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Understand the emerging technologies of wireless networks and routing protocols with WAP push architecture.

CO2.Formulate the knowledge of mobile computing, context manger -Architecture, Functions & its security.

CO3.Elaborate location and tracking management schemes and models with ALI technologies.

CO4.Criticize the principles, characteristics & architecture of pervasive computing and the trends of pervasive devices.

CO5.Explore the concepts of open protocols based on Context aware security.

TEXT 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.

REFERENCES

1. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
2. Uwe Hansmann etl , Pervasive Computing, Springer, New York,2001.

21MES156 MEDICAL IMAGE PROCESSING 3 1 0 4

COURSE OBJECTIVES:

- To provide an up-to-date background in state-of-the-art in medical imaging and medical image analysis.
- To illustrate how to extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

UNIT I INTRODUCTION 12

Introduction to medical imaging technology, systems, and modalities. Brief history; importance; applications; trends; challenges. Medical Image Formation Principles: X-Ray physics; X-Ray generation, attenuation, scattering; dose Basic principles of CT; reconstruction methods; artifacts; CT hardware.

UNIT II STORAGE AND PROCESSING 12

Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS); Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding; contrast enhancement; SNR characteristics; filtering; histogram modeling.

UNIT III VISUALIZATION 12

Medical Image Visualization Fundamentals of visualization; surface and volume rendering/visualization; animation; interaction. Magnetic Resonance Imaging (MRI) Mathematics of MR; spin physics; NMR spectroscopy; imaging principles and hardware; image artifacts.

UNIT IV SEGMENTATION AND CLASSIFICATION 12

Medical Image Segmentation - Histogram-based methods; Region growing and watersheds; Markov Random Field models; active contours; model-based segmentation. Multi-scale segmentation; semi automated methods; clustering-based methods; classification-based methods; atlas-guided approaches; multi-model segmentation. Medical Image Registration Intensity-based methods; cost functions; optimization techniques.

UNIT V NUCLEAR IMAGING 12

PET and SPECT Ultrasound Imaging methods; mathematical principles; resolution; noise effect; 3D imaging; positron emission tomography; single photon emission tomography; ultrasound imaging; applications. Medical Image Search and Retrieval Current technology in medical image search, content-based image retrieval, new trends: ontologies. Applications. Other Applications of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Gain the knowledge of Medical imaging Technology and the Formation Principles artifacts with CT hardware.

CO2.Analyze Medical Image Storage, picture Archiving, processing, and communication system based on SNR characteristics.

CO3.Design and implement medical image visualization principles, hardware, artifacts and Magnetic Resonance Imaging (MRI) with NMR spectroscopy.

CO4.Describe and implement medical image segmentation and classification methods, functions & techniques.

CO5.Construct medical image ontology applications for Computer Aided Diagnostic Support Systems through various nuclear imaging methods.

TEXT BOOKS

1. Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.

2. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

REFERENCES

1. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.

2. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.

3. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", First Edition, Prentice Hall, 2005.

4. John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

21MES157 INVEHICLE INTELLIGENT TRANSPORTATION SYSTEM 3 1 0 4

COURSE OBJECTIVES: At the conclusion of this course, the student should have a basic understanding of the following ITS-related issues:

- Definition of ITS, with particular emphasis on Advanced Traffic Management and Traveler Information Issues
- The historical context of ITS from both public policy and market economic perspectives
- Elements of Vehicle Location and Route Navigation and Guidance concepts

UNIT I ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS) 12

Advanced Driver Assistance Systems (ADAS) – Definition, Classification, Functions and Key Sensor technologies, In-vehicle Human Machine Interfaces (HMI) & User Experience Usability HMI design, development & testing approaches In-vehicle multimodal interfaces: voice, haptic, visual and physiological interaction

UNIT II SENSING PARAMETERS FOR ADAS 12

Wearable sensing parameters in ADAS, Effect on Autonomous Nervous Systems, Wearable biosensors, processing requirements, communication elements, power positioning, Alarms and Warning actuators, Application

UNIT III HYPOVIGILANCE 12

Introduction to Hypovigilance, Economics and mathematics of sleep, Reasons behind hypovigilance, circadian rhythms, Measures for detecting Drowsiness, Driver inattention, Measures for detecting inattention. Drunken driving –methods and detection

UNIT IV DATA COLLECTION 12

Methods to induce driver states, Sensor selection, Design strategies and issues in data collection, data collection protocol, experimental and real time set up, strategies, scenarios, acquiring real time data

UNIT V: RESEARCH ASPECTS 12

Case studies on drowsiness detection, inattention detection, drunken driving, Industry relevance, Available Commercial solutions

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Analyze the multimodal interface functionality and Key Sensor technologies of In-vehicle human machine interfaces in Advanced Driver Management system.

CO2.Evaluate the wearable sensing parameters in ADAS, biosensors, Alarms and Warning actuators based on Applications.

CO3.Impart the knowledge about hypo vigilance based on measures & methods for detecting Driver inattention.

CO4.Identify the issues, strategies on Sensor selection to acquire real time data on induce driver states.

CO5.Demonstrate different case studies related to driver assistance system.

TEXT BOOKS :

1. Driver Drowsiness Detection- Systems and Solutions, Aleksander Colic, Oge Marques, Borko Furht, 2014

REFERENCES:

1. Real-Time Physiological Signal Acquisition and Analysis for the Development of a Wearable Driver Assistance System, RAJIV RANJAN SINGH, 2014

WEBLINKS

21MES158 WIRELESS ADHOC AND SENSOR NETWORKS 3 1 0 4

COURSE OBJECTIVES:

The student should be made to:

- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of ad-hoc routing protocols.

UNIT I ADHOC NETWORKS AND ROUTING PROTOCOLS 12

Ad hoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices –Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet .Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) –Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source–Initiated On–Demand Approaches – Ad hoc On–Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) –Location–Aided Routing (LAR) – Power–Aware Routing (PAR) – Zone Routing Protocol (ZRP).

UNIT II MULTICAST ROUTING AND SECURITY 12

Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols –Summary of Tree and Mesh based Protocols – Energy–Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols - Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks –Classification of Transport Layer Solutions – TCP over Ad hoc Wireless Networks- Security in Ad Hoc Wireless Networks – Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks – Key Management – Secure Routing in Ad hoc Wireless Networks.

UNIT III QoS AND ENERGY MANAGEMENT 12

Issues and Challenges in Providing QoS in Ad hoc Wireless Networks – Classifications of QoS Solutions – MAC Layer Solutions – Network Layer Solutions – QoS Frameworks for Ad hoc Wireless Networks Energy Management in Ad hoc Wireless Networks – Introduction – Need forEnergy Management in Ad hoc Wireless Networks – Classification of Energy Management Schemes – Battery Management Schemes – Transmission Power Management Schemes – System Power Management Schemes.

UNIT IV SENSOR NETWORKS – ARCHITECTUREAND MACPROTOCOLS 12

Single node architecture – Hardware components, energy consumption of sensor nodes, Networkarchitecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hopnetworks, multiple sinks and sources, design principles, Development of wireless sensor networks. , physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management - MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and requirements, error control, framing, link management.

UNIT V SENSOR NETWORKS – ROUTING PROTOCOLS AND OPERATING SYSTEMS 12

Gossiping and agent-based uni-cast forwarding, Energy-efficient unicast, Broadcast and multicast, geographic routing, mobile nodes, Data-centric routing – SPIN, Directed Diffusion, Energy aware routing, Gradient-based routing –

Various aggregation techniques. Introduction to TinyOS – NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, Emulator TOSSIM.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Understand the basics of ad hoc network, types, issues, its challenges along with the classifications of routing protocols.

CO2.Elaborate multicast routing protocol operation, Architecture Reference Model, , classification, issues & challenges in Security Provisioning.

CO3.Identify the classification and challenges in QoS Framework & Energy management schemes in adhoc wireless networks.

CO4.Discuss and demonstrate about sensor networks architecture and MAC protocols.

CO5.Explain sensor networks routing protocols and various aggregation techniques.

TEXT BOOKS

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures andProtocols", Prentice Hall, PTR, 2004.

2. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR,2001.

3. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology-Protocols and Applications", John Wiley & Sons, 2007.

2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks: an information processingapproach", Else vier publication, 2004.

3. C.S.Raghavendra Krishna, M.Sivalingam and Tarib znati, "Wireless Sensor Networks",Springer publication, 2004.

4. Holger Karl , Andreas willig, "Protocol and Architecture for Wireless Sensor Networks", Johnwiley publication, Jan 2006.

5. K.Akkaya and M.Younis, " A Survey of routing protocols in wireless sensor networks",Elsevier Adhoc Network Journal, Vol.3, no.3,pp. 325-349, 2005.

6. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey",computer networks, Elsevier, 2002, 394 - 422.

7. Jamal N. Al-karaki, Ahmed E. Kamal, "Routing Techniques in Wireless sensor networks: A survey", IEEE wireless communication, December 2004, 6 – 28.

WEBLINKS

1. Philip Levis, " TinyOS Programming", 2006 – www.tinyos.net.

21MES159 **NETWORK PROTOCOLS** **3 1 0 4**

COURSE OBJECTIVES:

- To understand the existing network architecture models and analyze the their performance
- To understand the high speed network protocols and design issues.
- To learn Network Security Technologies and Protocols

UNIT I FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS **12**

Network Communication Architecture and Protocols - OSI Network Architecture seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model - Other Network Architecture Models: IBM SNA.

UNIT II ROUTED AND ROUTING PROTOCOLS **12**

Application Layer Protocols-Presentation Layer Protocols- Session Layer Protocols - Transport Layer Protocols - Network Layer Protocols - Data Link Layer Protocols - Routing Protocols – Multicasting Protocols - MPLS.

UNIT III ISDN AND NETWORK MANAGEMENT PROTOCOLS **12**

Overview of ISDN – Channels – User access – Protocols Network management requirements –Network monitoring – Network control – SNMP V1, V2 and V3 – Concepts, MIBs – Implementation issues-RMON.

UNIT IV SECURITY AND TELEPHONY PROTOCOLS **12**

Network Security Technologies and Protocols - AAA Protocols - Tunneling Protocols – Security Protocols- Private key encryption – Data encryption system, public key encryption – RSA – Elliptic curve cryptography – Authentication mechanisms– Web security -Secured Routing Protocols – IP telephony -Voice over IP and VOIP Protocols –Signaling Protocols- Media/CODEC.

UNIT V NETWORK ENVIRONMENTS AND PROTOCOLS **12**

Wide Area Network and WAN Protocols - Frame relay - ATM - Broadband Access Protocols –PPP Protocols - Local Area Network and LAN Protocols - Ethernet Protocols - Virtual LAN Protocols - Wireless LAN Protocols - Metropolitan Area Network and MAN Protocol - Storage Area Network and SAN Protocols.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1. Gain the knowledge of Network communication architecture and analyse the features of various protocol layers.

CO2.Design the basic design principles of broadband wired and wireless communication networks in business environment.

CO3.Evaluate the concepts, requirements, and implementation issues of network management protocols.

CO4.Build foundation to assess contemporary security policies and security mechanisms within organization.

CO5.Establish a solid knowledge of the layered approach that makes design, implementation and operation of extensive networks possible.

TEXT BOOKS:

1. Javvin, “Network Protocols” , Javvin Technologies Inc , second edition, 2005

2. William Stallings, “Cryptography and Network Security”, PHI, 2000.

REFERENCES:

1. Mani Subramanian, “Network Management–Principles and Practices”, Addison Wesley,2000.

2. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, AddisonWesley, 1999.

3. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

21MES160 NETWORK ROUTING ALGORITHMS 3 1 0 4

COURSE OBJECTIVES:

- To expose the students to the layered architecture for communication networks and the specific functionality of the network layer.
- To enable the student to understand the basic principles of routing and the manner this is implemented in conventional networks and the evolving routing algorithms based on Internetworking requirements, optical backbone and the wireless access part of the network.

UNIT I INTRODUCTION 12

ISO OSI Layer Architecture, TCP/IP Layer Architecture, Functions of Network layer, General Classification of routing, Routing in telephone networks, Dynamic Non hierarchical Routing (DNHR), Trunk status map routing (TSMR), real-time network routing (RTNR), Distance vector routing, Link state routing, Hierarchical routing.

UNIT II INTERNET ROUTING 12

Interior protocol : Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP). Multicast Routing: Pros and cons of Multicast and Multiple Unicast Routing, Distance Vector Multicast Routing Protocol (DVMRP), Multicast Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.

UNIT III ROUTING IN OPTICAL WDM NETWORKS 12

Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements, Wavelength Rerou ting- Benefits and Issues, Lightpath Migration, Rerouting Schemes, Algorithms- AG, MWPG.

UNIT IV MOBILE - IP NETWORKS 12

Macro-mobility Protocols, Micro-mobility protocol: Tunnel based : Hierarchical Mobile IP, Intra domain Mobility Management, Routing based: Cellular IP, Handoff Wireless Access Internet Infrastructure (HAWAII).

UNIT V MOBILE AD –HOC NETWORKS 12

Internet-based mobile ad-hoc networking communication strategies, Routing algorithms –Proactive routing: destination sequenced Distance Vector Routing (DSDV), Reactive routing: Dynamic Source Routing (DSR), Ad hoc On-Demand Distance Vector Routing (AODV), Hybrid Routing: Zone Based Routing (ZRP).

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Analyze the basic principles of routing and the manner this is implemented in conventional networks and the evolving routing algorithms based on Internetworking requirements, optical backbone and the wireless access part of the network.

CO2.Ability to configure routing algorithms over the routers

CO3.Gain the knowledge of principles behind the data transfer mechanisms over the conventional network

CO4.Compare routing algorithms, its requirements benefits and issues.

CO5.Apply Mathematical foundation to solve computational problems in computer networking

TEXT BOOKS

1. William Stallings, ' High speed networks and Internets Performance and Quality of Service', IInd Edition, Pearson

2. M. Steen Strub, ‘ Routing in Communication network, Prentice –Hall International, Newyork,1995.

REFERENCES:

1. S. Keshav, ‘An engineering approach to computer networking’ Addison Wesley 1999.

2. William Stallings, ‘High speed Networks TCP/IP and ATM Design Principles, Prentice- Hall,New York, 1995

3. C.E Perkins, ‘Ad Hoc Networking’, Addison – Wesley, 2001

4. Ian F. Akyildiz, Jiang Xie and Shantidev Mohanty, “ A Survey of mobility Management in Next generation All IP- Based Wireless Systems”, IEEE Wireless Communications Aug.2004, pp 16- 27.

5. A.T Campbell et al., “ Comparison of IP Micromobility Protocols,” IEEE Wireless Communications Feb.2002, pp 72-82.

6. C.Siva Rama Murthy and Mohan Gurusamy, “ WDM Optical Networks – Concepts, Design and Algorithms”, Prentice Hall of India Pvt. Ltd, New Delhi –2002.

21MES161 SIGNAL PROCESSING TECHNIQUES FOR SPEECH RECOGNITION 3 1 0 4

COURSE OBJECTIVES:

- To present overview of speech production mechanism and the algorithms
- To learn about Speech Production Mechanism, Speech Signal Processing concepts, Speech recognition, Feature selection, Distance measures for comparing speech patterns and GCI/GOI Algorithms

UNIT-I: THE SPEECH PRODUCTION MECHANISM 12

Physiological and Mathematical Model-Relating the physiological and mathematical model Categorization of Speech Sounds based on the source-system and the articulatory model. Basic Speech Signal Processing Concepts-Discrete time speech signals, relevant properties of the fast Fourier transform.

UNIT-II: SPEECH MODELING 12

Z-transform for speech recognition, convolution, linear and nonlinear filter banks-Spectral estimation of speech using the Discrete Fourier transforms-Pole-zero modeling of speech and linear prediction (LP) analysis of speech-Homomorphic speech signal de convolution, real and complex cepstrum, application of cepstral analysis to speech signals.

UNIT-III: FEATURE EXTRACTION FOR SPEECH RECOGNITION 12

Static and dynamic features for speech recognition, robustness issues, discrimination in the feature space, feature selection-Mel frequency cepstral co-efficients (MFCC), Linear prediction cepstral coefficients (LPCC), Perceptual LPCC. Distance measures for comparing speech patterns-Log spectral distance, cepstral distances, weighted cepstral distances, distances for linear and warped scales 48

UNIT-IV: DYNAMIC TIME WARPING FOR ISOLATED WORD RECOGNITION 12

Statistical models for speech recognition-Vector quantization models and applications in speaker recognition-Gaussian mixture modeling for speaker and speech recognition-Discrete and Continuous Hidden Markov modeling for isolated word and continuous speech recognition.

UNIT-V: GLOTTAL CLOSURE/OPENING INSTANTS ALGORITHMS 12

Hilbert Envelope based detection(HE) method-Dynamic Programming Phase Slope Algorithm (DYPSA)-Zero frequency resonator – based method(ZFR)-Speech Event Detection using Residual Excitation And a Mean-based Signal(SEDREAMS) and the Yet Another GCI Algorithm (YAGA).

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Analyze the various techniques involved in collecting the features from the speech signal in both time and frequency domain.

CO2.Compare the various techniques involved in speech and speaker detection.

CO3.Identify static and dynamic features for speech recognition

CO4.Illustrate how the speech production is modeled

CO5.Evaluate various speech compression techniques.

TEXT BOOKS

1. Thomas F. Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Pearson Education, 2008.

2. L. Rabiner and B. Juang, "Fundamentals of Speech Recognition", Prentice-Hall Signal Processing Series, 1993.

REFERENCES

1. JW Picone, "Signal Modeling Techniques in Speech Recognition", Proceeding of IEEE, June 1993.

2. JW Picone, "Signal Modeling Techniques in Speech Recognition", Proceeding of the IEEE Vol 81, No 9,September 1993.

3. SB Davis and P Mermelstein, "Comparison of Parametric Representations for Monosyllabic Word Recognition in Continuously Spoken Sentences", IEEE Transaction on Acoutics,Speech and Signal Processing, Vol ASSP 28, No.4, August 1980.

4. H Hermansky and N Morgan, "RASTA Processing of Speech", IEEE Transactions on Processing of Speech and Audio Processing, Vol 2, No.4, October 1994.

5. DA Reynolds and RC Rose, "Robust Text-Independent Speaker Identification Using Gaussian Mixture Speaker Models", IEEE Transaction on Speech and Audio Processing, Vol 3, No 1, January 1995.

6. LR Rabiner and BH Juang, "An Introduction to Hidden Markov Models", IEEE ASSP Magazine January 1986.

7. LR Rabiner, "A Tutorial on Hidden Markov Models and Selected Applications in Speech Recognition", Proceeding of IEEE, Vol 77, No 2, Feburary 1989.

8. Thomas Drugman, "Detection of Glottal Closure Instants from Speech Signals: a Quantitative Review, IEEE Transactions on Audio, Speech, and Language Processing", IEEE Transactions on Audio, Speech and Language Processing, Vol 20, No.3, March 2012.

21MES162 OFDM AND MIMO COMMUNICATION SYSTEMS 3 1 0 4

COURSE OBJECTIVES:

- To provide a state-of-art research status and an indepth treatment of selected topics in OFDM and OFDMA which would provide enough background in wireless network characteristics not realizable with current wireless infrastructure.
- To learn about basic MIMO communication systems, fading channels, Turbo codes and iterative decoding for MIMO systems.

UNIT I - RADIO CHANNEL MODELING, RESOURCE ALLOCATION, AND SPECTRUM EFFICIENCY 12

Introduction – Statistical characterization – OFDM/OFDMA channel models – OFDMA scheduling and resource allocation – System model – transmit spectra – Egress reduction techniques.

UNIT II - RESOURCE MANAGEMENT AND SYNCHRONIZATION: OFDM VS OFDMA 12

Resource allocation and Scheduling algorithms – Synchronization in OFDMA downlink and uplink – Synchronization for WIMAX

UNIT III - ADAPTIVE MODULATION AND TRAINING SEQUENCE DESIGN 12

Adaptive modulation algorithms – Channel feedback – Optimal condition for training sequence – Realization of Optimal training – Differential Space time Block codes – Differential Space frequency block codes

UNIT IV - FADING CHANNELS AND DIVERSITY TECHNIQUES 12

Wireless channels – Error/Outage probability over fading channels – Diversity techniques – Channel coding as a means of time diversity – Multiple antennas in wireless communications.

UNIT V - CAPACITY AND INFORMATION RATES OF MIMO CHANNELS 12

Capacity and Information rates of noisy, AWGN and fading channels – Capacity of MIMO channels – Capacity of non-coherent MIMO channels – Constrained signaling for MIMO communications. Matlab exercise

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Understand various channel models for MIMO OFDM systems

CO2.Analyze the capacity and BER performance to various MIMO OFDM systems

CO3.Estimate and correct the timing offset in the signal received at the MIMO OFDM reveiver.

CO4.Analyze the Information Theoretic advantages of MIMO systems

CO5.Evaluate the performance of Transceiver with spatial diversity

TEXT BOOK

1. Tao Jiang, Lingyang Song, and Yan Zhang, "Orthogonal Frequency Division Multiple Access (OFDMA) Fundamentals and Applications", Auberbach Publications, Taylor & Francis Group, 2010.

REFERENCES

1. Yi (Geoffrey) Li, and Gordon L. Stuber, " Orthogonal Frequency Division Multiplexing", Springer Science+Business Media Inc., NY, USA, 2006.

2. Tolga M. Duman and Ali Ghrayeb, "Coding for MIMO Communication systems", John Wiley & Sons, West Sussex, England, 2007.

21MES163 **ADAPTIVE SIGNAL PROCESSING** **3 1 0 4**

COURSE OBJECTIVE:

- To make the students conversant with the design aspects of Advanced Digital Signal Processing.
- To learn about Discrete Random Signal Processing, Spectrum Estimation, Linear Estimation and Prediction, Adaptive Filtering Concepts, Multirate Signal Processing Concepts

UNIT I - INTRODUCTION TO DISCRETE RANDOM SIGNAL PROCESSING **12**

Review of Linear Algebra, and Discrete Random Processes for random signal processing, Parseval's Theorem, Wiener Khintchine Relation - Power Spectral Density, Sum Decomposition Theorem, Spectral Factorization Theorem - Discrete Random Signal processing by Linear Systems - Low Pass Filtering of White Noise. Spectrum estimation

UNIT II - SPECTRUM ESTIMATION **12**

Non-Parametric Methods, Estimators and its Performance Analysis, Periodogram and it's based nonparametric methods - Signal Modeling and its Based Approach's - Parameter Estimation Using Yule- Walker Method.

UNIT III - LINEAR ESTIMATION AND PREDICTION **12**

Linear Estimation of Signals - Maximum Likelihood and Least Mean Squared Error Criterions – Wiener Filter - Discrete Wiener Hoff Equations, Kalman Filter, Linear Prediction, Whitening Filter, Inverse Filter, Levinson Recursion, Lattice Realization, and Levinson Recursion Algorithm for Solving Toeplitz System of Equations.

UNIT IV - ADAPTIVE FILTERING **12**

FIR Adaptive Filters, Steepest Descent Methods - Widrow Hoff, LMS Adaptive Algorithm – Adaptive filter applications in communication system, RLS Adaptive Filters and it's types - Simplified IIR LMS Adaptive Filter - Delay Line Structures.

UNIT V - MULTIRATE SIGNAL PROCESSING **12**

Mathematical Description of Change of Sampling Rate - Integer sampling rate conversions, Single and Multistage Realization - Poly Phase Realization - Application to Sub Band Coding and Coding Gain - Wavelet Transform and Filter Bank Implementation of Wavelet expansion of signals. 2D Filter Banks.

Total: 60 Hours

COURSE OUTCOMEs:

The student will be able to:

CO1.Explain the importance of signal processing in non-stationary environment.

CO2.Explain the role and importance of adaptive signal processing in communications signal processing

CO3.List and apply the various mathematical models to adaptive signal processing.

CO4.Design different adaptive filters for different applications

CO5.Use computer based simulation tools to understand the theoretical concepts of adaptive signal processing in various communication applications.

TEXT BOOKS

1. Monson H.Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons, Inc., Singapore, 2002

2. Sopocles J. Orfanidis, "Optimum Signal Processing", McGraw Hill, 2007

REFERENCES

1. John G.Proakis, Dimitris G.Manolakis, "Digital Signal Processing", Pearson Education, 2007.
2. B.Farhang-Boroujeny, "Adaptive Filters : Theory and Application", John Wiley and Sons Ltd, United Kingdom, 1998.
3. Simon Haykin , "Adaptive Filter Theory", 4/E, Pearson Education, South Asia, 2009.
4. Vaidyanathan P.P, "Multirate Systems and Filter Banks", Pearson Education, 2008.
5. Rafael C. Gonzalez, Richard E. Woods, " Digital Image Processing", Pearson Education Inc.,3/E, 2009.

21MES164 ADVANCED DIGITAL IMAGE PROCESSING 3 1 0 4

COURSE OBJECTIVES:

- To understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.
- To understand the image segmentation and representation techniques.
- To understand how image are analyzed to extract features of interest.

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UNIT I FUNDAMENTALS OF DIGITAL IMAGE PROCESSING 12

Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Review of morphological image processing

UNIT II SEGMENTATION 12

Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods, Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods

UNIT III FEATURE EXTRACTION 12

First and second order edge detection operators, Phase congruency, Localized feature extraction-detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features

UNIT IV REGISTRATION AND IMAGE FUSION 12

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching .Transformation functions-Similarity transformationand Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multiresolution based fusiondiscrete wavelet transform, Curvelet transform. Region based fusion.

UNIT V 3D IMAGE VISUALIZATION 12

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images.

TOTAL: 60 Hours

COURSE OUTCOMES:

The student will be able to:

CO1.Explain the essentials of digital image processing.

CO2.Describe various segmentation techniques for image analysis

CO3.Outline the various feature extraction techniques for image analysis

CO4.Discuss the concepts of image registration and fusion.

CO5.Illustrate 3D image visualization.

TEXT BOOKS:

1. John C.Russ, “The Image Processing Handbook”, CRC Press,2007.
2. Mark Nixon, Alberto Aguado, “Feature Extraction and Image Processing”, Academic Press, 2008.

3. Ardeshir Goshtasby, " 2D and 3D Image registration for Medical, Remote Sensing andIndustrial Applications",John Wiley and Sons,2005.

REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson,Education,Inc., Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson Education,Inc., 2002. RickS.Blum,Zheng Liu," Multisensor image fusion and its Applications",Taylor&Francis,2006.
3. Rick S.Blum,Zheng Liu," Multisensor image fusion and its Applications",Taylor& Francis,2006.

21MES165 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATION 3 1 0 4

COURSE OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation – Solutions of first order equations – Standard types and Equations reducibleto standard types – Singular solutions – Lagrange's Linear equation – Integral surfacepassing through a given curve – Classification of Partial Differential Equations –Solution of linear equations of higher order with constant coefficients – Linear nonhomogeneous PDE.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Halfrange Sine and Cosine series – Complex form of Fourier series – Parseval's identity–Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 12

Method of separation of Variables – Solutions of one dimensional wave equation and one- dimensional heat equation – Steady state solution of two-dimensional heat equation– Fourier series solutions in cartesian coordinates.

UNIT IV FOURIER TRANSFORM 12

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms –Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem –Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

TOTAL: 60 Hours

COURSE OUTCOMES:

The student will be able :

CO1. To have the opportunity to explore the standard methods of solution from a broader class of problems selected from astronomy, atmospheric science, biology, chemistry, physical oceanography, and physics.

CO2. To describe real time engineering problems using PDEs.

CO3. To apply Fourier series methods to solve boundary value problems for linear ODEs.

CO4. To use the Fourier transform as the tool to connect the time domain and frequency domain in signal processing.

CO5. To gain the knowledge in Z Transform to the Analysis of Digital Filters and Discrete Signal

TEXT BOOK:

1. Grewal B.S., —Higher Engineering Mathematics||, Khanna Publishers, New Delhi, 40th Edition, 2007.

1. Glyn James, —Advanced Modern Engineering Mathematics||, Pearson Education, New Delhi, 2007.

2. Ramana, B.V. —Higher Engineering Mathematics||, Tata McGraw Hill, New Delhi, 11th Reprint , 2010.

3. Bali N., Goyal M. and Watkins C., —Advanced Engineering Mathematics||, Firewall Media(An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.

4. Peter V.O'Neil, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

21MES166 MOBILE AD-HOC WIRELESS SENSOR NETWORKS 3 1 0 4

COURSE OBJECTIVES:

- Introduce the characteristic features of Ad-hoc wireless networks and their applications to the students
- Understand the functioning of different access and routing protocols that can be improve QoS.
- Learn the mobility in MANETs.
- Learn the energy efficiency in Ad-hoc Wireless networks

UNIT I INTRODUCTION TO MANETS AND MAC LAYER PROTOCOLS 12

Fundamentals of Wireless Networks– IP Limitations-Mobile Internet Protocol (IP)- Issues in Mobile IP- Differences between Cellular and Ad Hoc Wireless Networks Issues in Ad Hoc Wireless Networks-Classification of Ad-hoc Networks-MANET applications- Important Issues and the Need for Medium Access Control (MAC) Protocols.- Classification of MAC Protocols- Multiple-Channel MAC Protocols.

UNIT II ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS 12

Design Issues of Routing Protocols for Ad Hoc Networks- Classification of Routing Protocols- Proactive Routing- WRP, DSDV, OLSR Protocol- Reactive Routing- AODV, DSR, TORA, CBRP Protocol- Hybrid Routing.- ZRP, ZHLS

UNIT III QUALITY OF SERVICE (QOS) IN AD HOC NETWORKS 12

Introduction to QoS-Issues and Challenges Involved in Providing QoS-Classification of QoS Solutions- Medium Access Control (MAC)-Layer QoS Solutions- Network-Layer QoS Solutions- QoS Model- QoS Frameworks- INSIGNIA Protocol Commands INSIGNIA Protocol Operations- Reservation Establishment- QoS Reporting- Flow Restoration-Flow Adaptation-Intelligent Optimization Self-Regulated adjustment (INORA)- Coarse-Feedback Scheme-Class-Based Fine Feedback Scheme.

UNIT IV ENERGY MANAGEMENT SYSTEMS IN AD HOC WIRELESS NETWORKS 12

Classification of Energy Management Schemes- Overview of Battery TechnologiesPrinciples of Battery Discharge-Impact of Discharge Characteristics on Battery 43 Capacity- Battery Modeling- Battery-Driven System Design- Energy-Efficient Routing Protocol- Transmission Power Management Schemes- Transmission Power Control

UNIT V MOBILITY MODELS FOR MANET 12

Mobility Model Classifications-Formulation of Mobility Models- Mobility Metrics -Impact of Mobility Models on MANET- Random Walk Mobility- Notation, Characteristics of Random Walk Mobility, Stationary Distribution of Random Walk Mobility, Limitations of Random Walk Mobility Model - Random Waypoint Mobility- Notation ,Random Waypoint Stochastic Process, Transition Length and Duration, Limitations- Smooth Random Mobility- Notation, Characteristics of Smooth Random Mobility Model, Speed Control, Direction Control, Correlation Between Direction and Speed Change .

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.Compare the differences between cellular and ad hoc networks and the analyse the challenges at various layers and applications

CO2.Summarize the protocols used at the MAC layer and scheduling mechanisms

CO3.Compare and analyse types of routing protocols used for unicast and multicast routing

CO4.Examine the network security solution and routing mechanism

CO5.Evaluate the energy management schemes and Quality of service solution in ad hoc networks

TEXT BOOK:

1. Subir Kumar Sarkar, T.G. Basavaraju, C. Puttamadappa," Ad Hoc Mobile Wireless Networks: Principles, Protocols, and Applications", Second edition, AUERBACH PUBLICATIONS,,2013.

REFERENCES

1. Radhika RanjanRoy ,"Handbook of Mobile Ad HocNetworks for MobilityModels", Springer Science +Business Media, LLC 2011

2. Jonathan Loo, Jaime Lloret Mauri, Jesús Hamilton Ortiz, "Mobile Ad Hoc Networks: Current Status and Future Trends" CRC Press,2012. 4. B. V. V. S. PRASAD,"ROUTING ISSUES IN MANETs", Educreation Publishing- 2016

21MES167 WIRELESS SENSOR PROTOCOLS AND PROGRAMMING 3 1 0 4

COURSE OBJECTIVES

- Understand the overview, challenges in sensor network concepts
- Know about the radio technology, time synchronization and localization in Sensor Networks
- Learn about the MAC Protocols and MAC protocols in Tiny OS
- Know about various routing protocols, middleware and security issues in Wireless Sensor Networks

UNIT I FUNDAMENTALS OF SENSOR NETWORKS 12

Introduction to computer and wireless sensor networks and Overview of the syllabus- Motivation for a network of Wireless Sensor nodes- Sensing and sensors-challenges and constraints - node architecture-sensing subsystem, processor subsystem communication interfaces- prototypes, Application of Wireless sensors- Introduction of tiny OS Programming and TOSSIM Simulator.

UNIT II COMMUNICATION CHARACTERISTICS AND DEPLOYMENT MECHANISMS 12

Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies - Hardware- Telosb, Micaz motes- Time Synchronization- Clock and the Synchronization Problem - Basics of time synchronization-Time synchronization protocols - Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization

UNIT III MAC LAYER 12

Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks – Contention free MAC Protocols- characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering - Contention based MAC Protocols- Power Aware Multi-Access with signaling, Sensor MAC-Timeout MAC-Data gathering MAC- Case study –Implementation and Analysis of MAC player protocol in Tiny OS.

UNIT IV ROUTING IN WIRELESS SENSOR NETWORKS 12

Design Issues in WSN routing- Data Dissemination and Gathering-Routing Challenges in WSN - Flooding-Flat Based Routing – SAR, Directed Diffusion, Hierarchical Routing- LEACH, PEGASIS - Query Based Routing- Negotiation Based Routing Geographical Based Routing- Transport layer- Transport protocol Design issues- Performance of Transport Control Protocols. Case study- Implementation and analysis of Routing protocol or transport layer protocol in Tiny OS

UNIT V MIDDLEWARE AND SECURITY ISSUES 12

WSN middleware principles-Middleware architecture-Existing middleware – operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security. Case study- Handling attacks in Tiny OS

TOTAL: 60 Hours

COURSE OUTCOMES:

CO1.To understand the fundamentals of Wireless Sensor Networks

CO2.To gain the knowledge about applications of Wireless Sensor Networks

CO3.To learn the contention free MAC Protocols

CO4.To learn routing protocols of wireless sensor networks.

CO5.To gain the basic knowledge about Tiny OS

TEXT BOOK

1. Waltenegus Dargie, Christian Poellabauer , “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Series on wireless Communication and Mobile Computing, 2011

REFERENCES:

1. Kazem Sohraby, Daniel manoli , “Wireless Sensor networks- Technology, Protocols and Applications”, Wiley InterScience Publications 2010.

2. Bhaskar Krishnamachari , " Networking Wireless Sensors", Cambridge University Press, 2005

3. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "Wireless Sensor Networks", Springer Science 2004.

21MES168 MOBILE AND WIRELESS SECURITY 3 1 0 4

COURSE OBJECTIVES:

- To learn about the security and privacy problems in the realm of wireless networks and mobile computing
- To learn about the fields of mobile and wireless security and privacy and to graduate students seeking new areas to perform research.
- To understand the concept of RFID security.
- To analyse the various methods of Intrusion detection and Prevention

UNIT I INTRODUCTION 12

Security and Privacy for Mobile and Wireless Networks: Introduction- State of the ArtAreas for Future Research-General Recommendation for Research. Pervasive Systems: Enhancing Trust Negotiation with Privacy Support: Trust Negotiation Weakness of Trust Negotiation- Extending Trust Negotiation to Support Privacy

UNIT II MOBILE SECURITY 12

Mobile system architectures, Overview of mobile cellular systems, GSM and UMTS Security & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security.

UNIT III SECURING WIRELESS NETWORKS 12

Overview of Wireless security, Scanning and Enumerating 802.11 Networks, Attacking 802.11 Networks, Attacking WPA protected 802.11 Networks, Bluetooth Scanning and Reconnaissance, Bluetooth Eavesdropping, Attacking and Exploiting Bluetooth, Zigbee Security, Zigbee Attacks

UNIT IV ADHOC NETWORK SECURITY 12

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management in Adhoc Wireless Networks, Secure Routing in Adhoc Wireless Networks

UNIT V RFID SECURITY 12

Introduction, RFID Security and privacy, RFID chips Techniques and Protocols, RFID anti-counterfeiting, Man-in-the-middle attacks on RFID systems, Digital Signature Transponder, Combining Physics and Cryptography to Enhance Privacy in RFID Systems, Scalability Issues in Large-Scale Applications, An Efficient and Secure RFID Security Method with Ownership Transfer, Policy-based Dynamic Privacy Protection Framework leveraging Globally Mobile RFIDs, User-Centric Security for RFID based Distributed Systems, Optimizing RFID protocols for Low Information Leakage, RFID: an anti-counterfeiting tool.

TOTAL: 60 Hours

COURSE OUTCOMES:

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

CO1.Gain in-depth knowledge on wireless and mobile network security and its relation to the new security based protocols

CO2.Gain knowledge on open research problem in the field of mobile and wireless communication

CO3.Apply proactive and defensive measures to counter potential threats, attacks and intrusions

CO4.Study on the various intrusion detection and prevention methodologies in Mobile and Wireless network security

CO5.Have an insight on the RFID security practices and the mode of data transfer in it

TEXT BOOK

1. Noureddine Boudriga, "Security of Mobile Communications", ISBN 9780849379413, 2010 and Kia Makki, Peter Reiher, "Mobile and Wireless Network Security and Privacy ", Springer, ISBN 978-0-387-71057-0, 2007.

REFERENCES:

1. Siva Ram Murthy.C, Manoj B.S, "Adhoc Wireless Networks Architectures and Protocols", Prentice Hall, x ISBN 9788131706885, 2007.

SYLLABUS OF
AUDIT COURSES

21MACI11 **CONSTITUTION OF INDIA** **0 0 0 0**

COURSE OBJECTIVE:

- The purpose of the course is to acquaint the students with basic principles of the Constitution of India and its working.

UNIT I NATURE, OBJECT AND SCOPE OF THE CONSTITUTION **6**

Nature, object and scope of Constitutional Law and Constitutionalism – Historical Perspective of the Constitution of India – Salient Features and Characteristics of Constitution of India.

UNIT II FUNDAMENTAL RIGHTS **6**

Nature and scope of Fundamental Rights – Scheme of Fundamental Rights – Right to Equality – Right to Freedom of Speech and Expression – Right to Life – Right against Exploitation – Right to Religious Freedom – Minority Rights.

UNIT III DIRECTIVE PRINCIPLES OF STATE POLICY AND FUNDAMENTAL DUTIES **6**

Directive Principles of State Policy – Importance and Implementation – Scheme of Fundamental Duties and its Legal Status.

UNIT IV FEDERAL STRUCTURE **6**

Federal Structure – Distribution of Legislative and Financial Powers between the Union and the States – Parliamentary Form of Government in India – Constituent Powers and Status of the President of India.

UNIT V AMENDMENT AND EMERGENCY PROVISIONS **6**

Amendment of the Constitution – Procedure – Historical Perspective of the Constitutional Amendments in India – Emergency Provisions – National Emergency – President Rule – Financial Emergency – Local Self Government – Constitutional Scheme in India.

TOTAL: 30 Hours

COURSE OUTCOMES:

After successful completion of the Constitution of India course, the student will be able to

CO1.Understand the historical perspective of the Constitution of India and Meaning of the constitution law.

CO2.Know the Fundamental Rights and Fundamental Duties and its legal status

CO3.Understand the Federal structure and distribution of legislative and financial powers between the Union and the States.

CO4.Know the Parliamentary Form of Government in India; The constitution powers and status of the President of India.

CO5.Understand the Emergency Provisions of National Emergency, President Rule, and Financial Emergency.

REFERENCE BOOKS:

1. V.N. Shukla, "Constitutional Law of India", Eastern Book Company, 1982.
2. D.D. Basu, "Commentary on the Constitution of India"; Vol 12; LexisNexis, 2018.
3. S Pal, "India's Constitution –Origins and Evolution", LexisNexis, 2018.
4. Dr J N Pandey, "Constitutional Law Of India", Central Law Agency, 2020.

21MACI12 **SAFETY MANAGEMENT** **0 0 0 0**

COURSE OBJECTIVES:

- To provide the necessary basic concepts of safety in the industrial environment
- To enable the students to learn about various functions and activities of safety department.
- To have knowledge about sources of information for safety promotion and training.
- To familiarize students with evaluation of safety performance in manufacturing environment.

UNIT I SAFETY IN METAL WORKING MACHINERY AND WOOD WORKING MACHINES 6

General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines.

UNIT II PRINCIPLES OF MACHINE GUARDING 6

Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening Selection and suitability: lathe-drilling-boring-milling -grinding-shaping

UNIT III SAFETY IN WELDING AND GAS CUTTING 6

Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – leak detection-pipe line safety-storage and handling of gas cylinders.

UNIT IV SAFETY IN COLD FARMING AND HOT WORKING OF METALS 6

Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls.

Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills Safety in gas furnace operation.

UNIT V SAFETY IN FINISHING, INSPECTION AND TESTING 6

Heat treatment operations, electro plating, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing

Health and welfare measures in engineering industry-pollution control in engineering industry-industrial waste disposal.

TOTAL: 30 Hours

COURSE OUTCOMES:

After successful completion of the Industrial Safety course, the student will be able to

CO1.Understand the safety measures in metal & wood machinery

CO2.Know the principles of machine guarding

CO3.Acquire the knowledge in welding & gas cutting

CO4.Understand Safety precautions in cold & hot farming metals

CO5.Gain knowledge in inspection & testing

TEXT BOOKS

1. John V. Grimaldi and Rollin H. Simonds, "Safety Management" , All India Travelers Book seller, New Delhi, 1989.
2. N.V. Krishnan, "Safety in Industry" Jaico Publishery House, 1996.

REFERENCES

1. "Accident Prevention Manual" – NSC, Chicago, 1982.
2. "Occupational safety Manual" BHEL, Trichy, 1988.
3. Indian Boiler acts and Regulations, Government of India.
4. Safety in the use of wood working machines, HMSO, UK 1992.
5. Health and Safety in welding and Allied processes, welding Institute, UK, High Tech. Publishing Ltd., London, 1989.

21MACI21 DISASTER MANAGEMENT **0 0 0 0**

COURSE OBJECTIVES:

- To provide basic conceptual understanding of disasters.
- To understand approaches of Disaster Management
- To build skills to respond to disaster

UNIT I DEFINITION AND TYPES OF DISASTER **6**

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

UNIT II STUDY OF IMPORTANT DISASTERS **6**

Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management.

UNIT III ENVIRONMENTAL IMPACT OF DISASTERS **6**

Drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g) Earthquakes, Landside). Social Economics Causes.

UNIT IV MITIGATION AND MANAGEMENT TECHNIQUES OF DISASTER **6**

Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, Building design and construction in highly seismic zones, retrofitting of buildings.

UNIT V TRAINING, AWARENESS PROGRAM AND PROJECT ON DISASTER MANAGEMENT **6**

Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

TOTAL: 30 Hours

COURSE OUTCOMES :

CO1.To manage the Public Health aspects of the disasters.

CO2.To obtain, analyse, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

CO3. To design and perform research on the different aspects of the emergencies and disaster events while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.

CO4.To analyse and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.

CO5. To integrate knowledge and to analyse, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.

TEXT BOOKS:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)

REFERENCES

1. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
2. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
3. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD

21MACI22 **PEDAGOGY STUDIES** **0 0 0 0**

COURSE OBJECTIVES:

Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY **6**

Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Model Curriculum of Engineering & Technology PG Courses

UNIT II OVERVIEW OF METHODOLOGY AND SEARCHING **6**

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES **6**

Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT **6**

Alignment with classroom practices and follow-up support Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS **6**

Research design, Contexts , Pedagogy ,Teacher education , Curriculum and assessment ,Dissemination and research impact.

TOTAL: 30 Hours

COURSE OUTCOMES:

Students will be able to understand:

CO1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

CO2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

CO3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

TEXT BOOK

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

REFERENCES

3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International
5. Journal Educational Development, 33 (3): 272–282. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

21MACI31	STRESS MANAGEMENT BY YOGA	0	0	0	0

COURSE OBJECTIVE:

1. Meaning of yoga, Importance of yoga in our daily life, important aspects during of yoga.
2. Different type of yoga.
3. Renowned Yogies of India.
4. Importance of Way of Meditation.
5. Knowledge of Samadhi and Nabhi- Pariksha.

COURSE CONTENT

Meaning & Importance of Yoga, Importance of Precautions of Place. Time and Food. Helpful and disturbing aspects during practice of yoga.Various Kinds of yoga:-Bhakti Yoga, Karma Yoga, Hatha Yoga & Ashtang Yoga. Introduction of some prominent yogis-Maharishi Patanjali Swami Shivananda. Chakras and their importance, Kundalini, Five Kleshs, Five States (Bhumies) of Chitra.

TOTAL: 30 Hours

REFERENCES:

1. Ghosh,A.K., "A Synthetic approach to Diet and Nutrition", Swami Mangalteerthama Nutan Publication, Deoghar, 2005.
2. Iyengar, B.K.S., "Astadal Yoga Mala, (Vol I – VIII)", Allied publishers Pvt. Ltd., Lucknow, 2009.
3. Dr. Rakhee Mehra, "Ayurveda Eka Parichaya", MDNIY, New Delhi, 2010.
4. Goel, Aruna & Goel, S. L., "Stress Management and Education", Deep & Deep Publications New Delhi, 2005.

21MACI32 **VALUE EDUCATION** **0 0 0 0**

COURSE OBJECTIVE:

1. To understand importance and need for value education.
2. Appreciate various activities organized by the schools to develop desirable values in the students
3. Conduct various talks and programs for value education and gain knowledge of various models for value education
4. Understand role of teachers for inculcation of values in the students

UNIT I Value Education & Need **6**

Concept of Values and Value Education; Historical Background of Value Education Aims and Objectives of Value Education Need, Importance and Role of Value Education in the present emerging Indian society Classification of Values

Unit II Theories & Model of Value Development **6**

Theories of Value Development: Psycho-analytic, Learning theory – social learning Cognitive development , Piaget an Kohlberg Models of Value Development : Value Analysis, Rationale Building, Social Action , The Consideration Model

Unit III Types of Values & Profession **6**

Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity. Professional Values-Knowledge thirst, sincerity in profession, regularity, punctuality and faith. Religious Values - Tolerance, wisdom, character. Modernity vs. Value crisis, Issues and challenges Value orientation of Teacher education curricula in India

Unit IV Value & Character Building **6**

Concept of Morality and Moral Judgment Aspects of Moral Education – Liberal, Social, Religious, Psychological Development of Moral Character And Attitude Role of Media in developing values and morality

UINT V Transactional Strategies **6**

Discussions, lectures, debates, workshops, conduct of various speeches and talks .

TOTAL:30 Hours

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

CO1.Understand importance and need for value education

CO2.Appreciate various activities organized by the schools to develop desirable values in the students

CO3.Conduct various talks and programs for value education

CO4.Gain knowledge of various models for value education

CO5.Understand role of teachers for inculcation of values in the students

TEXT BOOKS:

1. Josta,H.R.(1991).Spiritual values and education. Ambala Cantt: Associated Publishers.
2. Kluckhokhn, C.(1961). The Study of Values. In D.N. Barett (ed), value in America. Norte Dame:University of Norte Dame Press.
3. Kothari D.S. Education and Values, Report of the orientation course-cum-workshop on Education in Human Values. New Delhi.

REFERENCES:

1. Malhotra P.L. Education, Social Values and Social Work-the Task for the New Generation, New Delhi: N.C.E.R.T..
2. Morris, Charles (1956). Varieties of human values. Chicago: University of Chicago press.
3. Mukerjee, R.K., (1969). Social structure of values. New Delhi: S. Chand and Co.
4. NCERT (1992).Education in values, New Delhi.