VELS UNIVERSITY

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)

NAAC ACCREDITED

PALLAVARAM - CHENNAI - INDIA

M.E.
Computer Science and Engineering

Curriculum and Syllabus

(Based on Choice Based Credit System)

Effective from the Academic Year

2017-2018

Department of Computer Science and Engineering

School of Engineering

PROGRAM EDUCATIONAL OBJECTIVES(PEO)

PEO1: To adapt to the changing societal and technological challenges in both Industrial application and Research

PEO2: To become Entrepreneurs or Employees of reputed Organizations or pursue Higher Education.

PEO3: To practice their profession in a collaborative, team-oriented manner that embraces the multidisciplinary and multicultural environment.

PEO4: To function as a responsible member of society with high ethical values and commitment to solve relevant social needs.

PEO5: To be a lifelong learner so that the next generation can be mentored.

PROGRAM OUTCOME (PO)

PO1: An understanding of the theoretical foundations and the limits of computing.

PO2: An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.

PO3: An ability to design, develop and evaluate new computer-based systems for novel applications which meet the desired needs of industry and society.

PO4: Understanding and ability to use advanced computing techniques and tools.

PO5: An ability to undertake original research at the cutting edge of computer science & its related areas

PO6: An ability to function effectively individually or as a part of a team to accomplish a stated goal.

PO7: An understanding of professional and ethical responsibility.

PO8: An ability to communicate effectively with a wide range of audience.

PO9: An ability to learn independently and engage in life¬long learning.

PO10: An understanding of the impact of IT related solutions in an economic, social and environment context

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: An expert who understands and develop methodologies of computer systems to gage the hardware and software enterprise in research and industry.

PSO2: A Professional who comprehends the technological advances that sways the societal, legal, ethical and cultural upshots of computer knowhow and be accountable to society and to be an effective mentor.

ME - COMPUTER SCIENCE AND ENGINEERING CURRICULUM

Total number of Credits : 80

Category	Code	Course	Hour / Week			
			Lecture	Tutorial	Practical	Credits
SEMESTER 1						
Core	15MES011	Operations Research	3	1	0	4
Core	15MES012	Advanced Data Structures and Algorithms	3	1	0	4
Core	15MES013	Advanced Computer Architecture	3	1	0	4
Core	15MES014	Object Oriented Systems Engineering	3	1	0	4
DSE	15MES___	Discipline Specific Elective I	3	0	0	3
Core	15MES015	Seminar 1	0	0	6	2
			15	4	6	21
SEMESTER 2						
Core	15MES021	UNIX Internals	3	1	0	4
Core	15MES022	Compiler Optimization	3	1	0	4
Core	15MES023	Parallel Algorithms	3	1	0	4
DSE	15MES___	Discipline Specific Elective II	3	0	0	3
GE	15MES___	Generic Elective I	3	0	0	3
Core	15MES024	UNIX Laboratory	0	0	6	3
Core	15MES025	Inplant Training	0	0	0	2
			15	3	6	23
SEMESTER 3						
DSE	15MES___	Discipline Specific Elective III	3	0	0	3
DSE	15MES___	Discipline Specific Elective IV	3	0	0	3
GE	15MES___	Generic Elective II	3	0	0	3
Core	15MES031	Project Work – Phase 1	0	0	18	9
			9	0	18	18
SEMESTER 4						
Core	15MES041	Project Work – Phase 2	0	0	30	18
			0	0	30	18

M.E. - COMPUTER SCIENCE AND ENGINEERING

List of Discipline Specific Elective Courses

15MES101	Component Based Development
15MES102	Performance Evaluation of Systems and Networks
15MES103	Knowledge Engineering
15MES104	Visualization Techniques
15MES105	Infometrics
15MES106	User Interface Design
15MES107	Network Engineering and Management
15MES108	Language Technologies
15MES109	Knowledge Management
15MES110	Advanced Database Technology
15MES111	Integrated Software Project Management
15MES112	Principles of Multimedia
15MES113	Virtualization Techniques
15MES114	Service Oriented Architecture
15MES115	Ethical Hacking and Digital Forensics
15MES116	Machine Learning
15MES117	Database Tuning
15MES118	Enterprise Resource Planning
15MES119	Human Resources Management
15MES120	Multicore Architecture
15MES121	Big data Analytics
15MES122	Information Retrieval Techniques
15MES123	Social Network Analysis and Mining
15MES124	Data Mining Techniques
15MES125	Advanced Database Management Systems.
15MES126	Cloud Computing
15MES127	Cloud Security
15MES128	Cloud Storage Infrastructures

List of Generic Elective Courses

15MES151	Speech Processing
15MES152	Bio informatics
15MES153	ASIC Design
15MES154	Embedded Systems
15MES155	Mobile and Pervasive Computing
15MES156	Medical Image Processing
15MES157	Invehicle Intelligent Transportation System
15MES158	Wireless Adhoc and Sensor Networks
15MES159	Network Protocols
15MES160	Network routing Algorithms
15MES161	Signal Processing Techniques For Speech Recognition
15MES162	OFDM and MIMO Communication Systems
15MES163	Adaptive Signal Processing
15MES164	Advanced Digital Image Processing
15MES165	Transform Techniques and Partial Differential Equation

Syllabus

Core Courses

15MES011 OPERATIONS RESEARCH 3 1 0 4

Course Objective:

To study and understand the concepts of Queueing Models, Advanced Queueing Models,Simulation and its Applications to Queueing systems, Linear Programming and Non-Linear Programming.

UNIT I QUEUEING MODELS 12

Poisson Process – Markovian Queues – Single and Multi-server Models – Little's formula – Machine Interference Model – Steady State analysis – Self Service Queue.

UNIT II ADVANCED QUEUEING MODELS 12

Non- Markovian Queues – Pollaczek Khintchine Formula – Queues in Series – Open Queueing Networks –Closed Queueing networks.

UNIT III SIMULATION 12

Discrete Even Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to Queueing systems.

UNIT IV LINEAR PROGRAMMING 12

Formulation – Graphical solution – Simplex method – Two phase method -Transportation and Assignment Problems.

UNIT V NON-LINEAR PROGRAMMING 12

Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn – Tucker conditions – Quadratic Programming.

TOTAL: 60 h

TEXT BOOKS

1. Winston.W.L. "Operations Research", Fourth Edition, Thomson – Brooks/Cole, 2003.
2. Taha, H.A. "Operations Research: An Introduction", Ninth Edition, Pearson Education Edition, Asia, New Delhi, 2002.

REFERENCES

1. Robertazzi. T.G. "Computer Networks and Systems – Queuing Theory and Performance Evaluation", Third Edition, Springer, 2002 Reprint.
2. Ross. S.M., "Probability Models for Computer Science", Academic Press, 2002.

15MES012 ADVANCED DATA STRUCTURES AND ALGORITHMS 3 1 0 4

Course Objective:

- 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 h

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.

15MES013 ADVANCED COMPUTER ARCHITECTURE 3 1 0 4

Course Objective*:* 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 h

TEXT BOOKS

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier, 4th. edition, 2007. (Unit I to Unit IV,)
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.

15MES014 OBJECT ORIENTED SYSTEMS ENGINEERING 3 1 0 4

Course Objective:

- 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 h

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.

3. Alistair Cockburn, Agile Software Development 2nd ed, Pearson Education, 2007.

15MES021 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 get thorough understanding of the kernel. To understand the file organization and management. To know the various system calls. To have a 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.

UNIT 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 h

TEXT BOOK

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

REFERENCES

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 Unix Operating System”, Addison Wesley, 1998.

15MES022 COMPILER OPTIMIZATION 3 1 0 4

Course Objective: 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 h

REFERENCES

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)

4. Charles N. Fischer, Richard J. Leblanc, “Crafting a compiler with C”, Benjamin Cummings, 1991.

15MES023 PARALLEL ALGORITHM 3 1 0 4

Course Objective:

- 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 AlgorithmsParallel 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 - Serial Polyadic DP 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 h

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

15MES024 UNIX LABORATORY 0 0 6 3

Course Objective:

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

List of Experiments:

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: 30 h

Syllabus
Discipline Specific Elective Courses

15MES101 COMPONENT BASED DEVELOPMENT 3 0 0 3

Course objective: 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 9

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 9

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 9

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 9

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 – app domains – contexts – reflection – remoting.

UNIT V COMPONENT FRAMEWORKS AND DEVELOPMENT 9

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: 45 h

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.
2. Kuth Short, " Component Based Development and Object Modeling ", Sterling Software,1997.

15MES102 PERFORMANCE EVALUATION OF SYSTEMS AND NETWORKS 3 0 0 3

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 9

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 **9**

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 **9**

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 **9**

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 **9**

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: 45 h

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

15MES103 KNOWLEDGE ENGINEERING 3 0 0 3

Course Objective :

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

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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

UNIT V ACTIONS AND PLANNING 9

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: 45 h

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

15MES104 VISUALIZATION TECHNIQUES 3 0 0 3

Course Objective: To introduce visual perception and core skills for visual analysis. For Understanding the need for visualization. To make advance insightful visuals. . To implement techniques in ranking analysis , deviation analysis, distribution analysis, correlation analysis, multivariate analysis. Also to understand issues and best practices in information.

UNIT I VISUALIZATION 9

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 9

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 9

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 9

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 9

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: 45 h

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.

15MES105 INFOMETRICS 3 0 0 3

Course Objective:

- 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 9

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 9

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 9

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 9

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 9

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

TOTAL: 45 h

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.

15MES106 USER INTERFACE DESIGN 3 0 0 3

Course Objective: 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 9

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 9

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 9

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 9

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

UNIT V WINDOWS LAYOUT– TEST 9

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: 45 h

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.

REFERENCE

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

15EMCE07 NETWORK ENGINEERING AND MANAGEMENT 3 0 0 3

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

UNIT I FOUNDATIONS OF NETWORKING 9

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

UNIT II QUALITY OF SERVICE 9

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in inelastic traffic

UNIT III HIGH PERFORMANCE NETWORKS 9

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop 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 9

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 9

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

TOTAL: 45 h

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

15MES108 LANGUAGE TECHNOLOGIES 3 0 0 3

Course Objective: To introduce theories and techniques of natural language processing and language technology. It attempts 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 9

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

UNIT II INFORMATION RETRIEVAL 9

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 9

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

UNIT IV GENERIC ISSUES 9

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 9

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: 45 h

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

15MES109 KNOWLEDGE MANAGEMENT 3 0 0 3

Course Objective: 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 9

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 9

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 9

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 9

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 9

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: 45 h

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

15MES110 ADVANCED DATABASE TECHNOLOGY 3 0 0 3

Course Objective:

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

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – 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 9

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

UNIT III XML DATABASES 9

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

UNIT IV MOBILE DATABASES 9

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

UNIT V MULTIMEDIA DATABASES 9

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

TOTAL: 45 h

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 Management”, Third Edition, Pearson Education, 2007.
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.

15MES111 INTEGRATED SOFTWARE PROJECT MANAGEMENT 3 0 0 3

Course Objective:

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

UNIT I PROJECT MANAGEMENT CONCEPTS 9

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 9

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 9

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

UNIT IV METRICS 9

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 9

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: 45 h

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.

15MES112 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 9

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

UNIT II ELEMENTS OF MULTIMEDIA 9

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 9

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 9

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 9

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: 45 h

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.

15MES113 VIRTUALIZATION TECHNIQUES 3 0 0 3

Course Objective:

- 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 9

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 9

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 9

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 9

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

UNIT V VIRTUAL MACHINES PRODUCTS 9

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

TOTAL: 45 h

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.

15MES114 SERVICE ORIENTED ARCHITECTURE 3 0 0 3

Course Objective:

- 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 9

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models

UNIT II WEB SERVICES 9

Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder objectives – benefits of SPA – Cost Savings

UNIT III SOA IMPLEMENTATION 9

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 9

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 9

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: 45h

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.

15MES115 ETHICAL HACKING AND DIGITAL FORENSICS 3 0 0 3

Course objective:

- 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 9

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 9

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 9

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 9

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 9

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 : 45 h

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)

15MES116 MACHINE LEARNING 3 0 0 3

Course Objective: To introduce about the basic concepts and techniques of Machine Learning, to develop skills of recent machine learning software for solving practical problems, to be able to formulate machine learning problems corresponding to different applications and to understand a range of machine learning algorithms along with their strengths and weaknesses.

UNIT I INTRODUCTION 9

Learning Problems – Perspectives and Issues in Machine Learning: Issues in Machine Learning – Concept Learning: A concept learning task, Concept learning as search – Version Spaces and Candidate Elimination Algorithm: Representation, The LIST-THEN-ELIMINATE Algorithm, A more compact representation for version spaces – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural Network Representation – Appropriate Problems for Neural Network Learning – Perceptrons: Representational power of perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics in Artificial Neural Networks – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING 9

Baysian Learning: Bayes Theorem, Concept Learning, Maximum Likelihood and least-squared hypothesis – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING 9

Instant based learning: K- Nearest Neighbour Learning: Distance weighed nearest neighbor algorithm, remarks on k-nearest algorithm, A note on terminology – Locally weighted Regression: Locally weighted linear regression, Remarks on locally weighted regression – Radial Bases Functions – Case Based Learning.

UNIT V ADVANCED LEARNING 9

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TOTAL: 45 h

TEXT BOOKS

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Science /Engineering /Math; 1 edition, 1997.

REFERENCES

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Science /Engineering /Math; 1 edition, 1997
2. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press 2004
3. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1 edition, 2001

15MES117 DATABASE TUNING 3 0 0 3

Course Objective:

- 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 8

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 8

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 10

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 10

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 9

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

Total : 45 h

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.

15MES118 ENTERPRISE RESOURCE PLANNING 3 0 0 3

Course Objective:

- 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 9

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 9

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

UNIT III BUSINESS MODULES 9

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

UNIT IV ERP MARKET 9

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 9

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 : 45h

REFERENCES

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.
3. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning – concepts and Planning”, Prentice Hall, 1998.
4. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill

15MES119 HUMAN RESOURCE MANAGEMENT 3 0 0 3

Course Objective:

- 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 9

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 9

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 9

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 9

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 9

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 : 45h

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.
7. Ivancevich, Human Resource Management, McGraw Hill 2002.

15MES120 MULTICORE ARCHITECTURE 3 0 0 3

Course Objective:

- To understand the recent trends in the field of computer architecture and to identify the performance related parameters of parallel processing .
- To expose the problems related to multiprocessing.
- To understand the different types of multicore architectures .

UNIT I FUNDAMENTALS OF QUANTITATIVE DESIGN AND ANALYSIS 9

Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Classes of Parallelism - ILP, DLP, TLP and RLP - Multithreading - SMT and CMP Architectures – Limitations of Single Core Processors - The Multicore era – Fundamentals of SuperScalar Processor Design, Introduction to Multicore Architecture – Chip Multiprocessing, homogeneous Vs heterogeneous design - SMP – Multicore Vs Multithreading.

UNIT II TLP AND MULTIPROCESSORS 9

Shared memory architectures: Symmetric and Distributed Shared Memory Architectures – synchronization – Memory organization – Cache Memory – Cache Coherency Protocol: Issues . – Cache Coherence Issues - Performance **Issues** Design of Levels of Caches. – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT III PROGRAMMING MODELS 9

Defintion of a model : Declarative and procedural models Multicore programming Model: – Shared memory model, message passing model, transaction model – OpenMP and MPI Programming.

UNIT IV POWER MANAGEMENT 9

PowerPC architecture :power PC family, super scalar, compound instructions, Branching technique – Power PC Adressing modes: pipeline stages– RISC design, PowerPC ISA, PowerPC Memory Management Power 5 Multicore architecture design, Power 6 Architecture.

UNIT V MULTICORE DESIGNS 9

Multicore core designs: Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element) : SPE Context creation , program image Event handling – Cell Software Development Kit: Data Communication and Synchronization (DaCS), PDT reporting tools Programming for Multicore architecture.

TOTAL: 45h

TEXT BOOKS

1. Hennessey & Pateterson, “Computer Architecture A Quantitative Approach”, Harcourt Asia, Morgan Kaufmann, 1999
2. Joseph JaJa, Introduction to Parallel Algorithms, Addison-Wesley, 1992.

REFERENCES

1. IBM Journals for Power 5, Power 6 and Cell Broadband engine architecture.
2. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” McGraw-Hill, 1993
3. Richard Y. Kain, “Advanced Computer Architecture: A System Design Approach”, PHI, 1999
4. Rohit Chandra, Ramesh Menon, Leo Dagum, and David Kohr, Parallel Programming in OpenMP, Morgan Kaufmann, 2000.

15MES121 BIG DATA ANALYTICS 3 0 0 3

Course Objective:

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

UNIT I INTRODUCTION TO BIG DATA 8

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 9

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – 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 10

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 9

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 9

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 InfoSphereBigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

TOTAL : 45 h

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.
5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced 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

15MES122 INFORMATION RETRIEVAL TECHNIQUES 3003

Course Objective:

- 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 9

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 9

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 9

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 9

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 9

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 : 45 PERIODS

REFERENCES:

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

15MES123 SOCIAL NETWORK ANALYSIS AND MINING 3003

Course Objective:

- 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 I INTRODUCTION TO SOCIAL NETWORK ANALYSIS AND KNOWLEDGE REPRESENTATION 9

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 9

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 9

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 9

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 9

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 : 45 PERIODS

REFERENCES:

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 University Press, 2014.
5. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 2011.
6. Dion Goh and Schubert Foo, “Social information retrieval systems: emerging technologies and Applications for searching the Web effectively”, Idea Group, 2007.
7. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and social Information retrieval and access: Techniques for Improved User Modelling”, Information Science Reference, 2009.
8. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2010.

15MES124 DATA MINING TECHNIQUES 3003

Course Objective:

- 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 **9**

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 **9**

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 **9**

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 **9**

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 **9**

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: 45 PERIODS

REFERENCES:

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

15MES125 ADVANCED DATABASE MANAGEMENT SYSTEMS 3003

Course Objectives:

- To understand the underlying principles of Relational Database Management System.
- To understand and implement the advanced features of DBMS.
- To develop database models using distributed databases.
- To implement and maintain an efficient database system using emerging trends.

UNIT I RELATIONAL MODEL **9**

Data Model – Types of Data Models: – Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Structured Query Language – Database Normalization – Transaction Management.

UNIT II PARALLEL AND DISTRIBUTED DATABASES **9**

Centralized and Client-Server 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.

UNIT III XML DATABASES **9**

XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity.

UNIT IV MULTIMEDIA DATABASES **9**

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

UNIT V CURRENT ISSUES **9**

Active Databases – Deductive Databases – Data Warehousing – Data Mining – Database Tuning – Database Security

TOTAL: 45 PERIODS

REFERENCES

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Addison-Wesley, 2011.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. V.S.Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt. Ltd., 2001.

15MES126 CLOUD COMPUTING 3003

Course Objectives:

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator

UNIT I CLOUD ARCHITECTURE AND MODEL **9**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing –NIST Cloud Computing Reference Architecture.Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vsPrivate Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT II VIRTUALIZATION **9**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices -Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT III CLOUD INFRASTRUCTURE **9**

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

UNIT IV PROGRAMMING MODEL **9**

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, Aneka, CloudSim

UNIT V SECURITY IN THE CLOUD 9

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security –Security Governance – Risk Management – Security Monitoring – Security Architecture Design –Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Total: 45h

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation,Management, and Security”, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
4. Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011.
5. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure iN the Cloud” O'Reilly
James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, “Grid and Cloud Computing –A Business Perspective on Technology and Applications”, Springer.
8. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010.

15MES127 CLOUD SECURITY 3003

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: 9

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: 9

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: 9

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 IV TECHNOLOGIES FOR VIRTUALIZATION-BASED SECURITY ENHANCEMENT 9

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: 9

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: 45h

REFERENCES:

1. Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance [ISBN: 0596802765]
2. Ronald L. Krutz, Russell Dean Vines, Cloud Security [ISBN: 0470589876]
3. John Rittinghouse, James Ransome, Cloud Computing [ISBN: 1439806802]
4. J.R. ("Vic") Winkler, Securing the Cloud [ISBN: 1597495921]
5. Cloud Security Alliance 2009, Security Guidance for Critical Areas of Focus in Cloud

15MES128 CLOUD STORAGE INFRASTRUCTURES 3003

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 9

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 9

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 9

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 9

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 9

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: 45h

REFERENCES

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

2. Marty Poniatowski, “Foundations of Green IT” Prentice Hall; 1 edition [ISBN: 978-0137043750], 2009. 3. EMC, “Information Storage and Management” Wiley; 2 edition [ISBN: 978- 0470294215],2012.

4. Volker Herminghaus, Albrecht Scriba, “Storage Management in Data Centers” Springer; editioN [ISBN: 978-3540850229]. 2009.

5. Klaus Schmidt, “High Availability and Disaster Recovery” Springer; edition [ISBN: 978-3540244608], 2006.

Syllabus
Generic Elective Courses

15MES151 SPEECH PROCESSING 3 0 0 3

Course Objective: 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 9

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 9

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 9

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 9

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 9

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: 45 h

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. A Brief Introduction to Speech Analysis and Recognition, An Internet Tutorial - http://www.mor.itesm.mx/~omayora/Tutorial/tutorial.html
4. Daniel Jurafsky & James H.Martin, “Speech and Language Processing”, Pearson Education ,2000.

15MES152 BIO INFORMATICS 3 0 0 3

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 9

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 9

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 9

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 9

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 9

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: 45 h

TEXT BOOK

1. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.

REFERENCE BOOK

1. T.K.Attwood and D.J. Perry Smith, “Introduction to Bio Informatics, Longman Essen,1999.

15MES153 ASIC DESIGN 3 0 0 3

Course Objective:

- 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 9

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 9

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 9

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 9

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 9

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: 45 h

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)

15MES154 EMBEDDED SYSTEMS 3 0 0 3

Course Objective:

- 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 9

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 9

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 9

Profiling and cycle counting – instruction scheduling – Register allocation – conditional execution – looping constructs – bit manipulation – efficient switches – optimized primitives.

UNIT IV PROCESSES AND OPERATING SYSTEMS 9

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 9

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: 45 h

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.

15MES155 MOBILE AND PERVASIVE COMPUTING 3 0 0 3

Course Objective:

- 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 9

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 9

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

UNIT III Location and Tracking Management 9

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 9

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 9

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: 45 h

REFERENCES

1. Ivan Stojmenovic , Handbook of Wireless Networks and Mobile Computing, John Wiley & sons Inc, Canada, 2002.
2. Asoke K Taukder,Roopa R Yavagal,Mobile Computing, Tata McGraw Hill Pub Co. , New Delhi, 2005.
3. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
4. Uwe Hansmann etl , Pervasive Computing, Springer, New York,2001.

15MES156 MEDICAL IMAGE PROCESSING 3 0 0 3

Course Objective:

- 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 9

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 9

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 9

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 9

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 9

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: 45 h

REFERENCE 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.
3. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.
4. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.
5. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", First Edition, Prentice Hall, 2005.
6. John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

15MES157 INVEHICLE INTELLIGENT TRANSPORTATION SYSTEM 3003

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 1: Advanced Driver Assistance Systems (ADAS) 9

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 2: Sensing Parameters for ADAS 9

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 9

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 9

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 **9**

Case studies on drowsiness detection, inattention detection, drunken driving, Industry relevance, Available Commercial solutions

TOTAL: 45h

References:

1. Driver Drowsiness Detection- Systems and Solutions, Aleksander Colic, Oge Marques, Borko Furht, 2014
2. https://www.tuck.com/sleep-resources/
3. Real-Time Physiological Signal Acquisition and Analysis for the Development of a Wearable Driver Assistance System, RAJIV RANJAN SINGH, 2014

15MES158 WIRELESS ADHOC AND SENSOR NETWORKS 3003

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 **9**

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 **9**

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 9

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 9

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 9

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 – COUGAR, ACQUIRE, Hierarchical Routing – LEACH, PEGASIS, Location Based Routing – GAF, GEAR, Data aggregation – Various aggregation techniques. Introduction to TinyOS – NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, Emulator TOSSIM.

Total: 45h

REFERENCES:

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.
4. Kazem Sohraby, Daniel Minoli and Taieb Znati, “ Wireless Sensor Networks Technology-Protocols and Applications”, John Wiley & Sons, 2007.
5. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks: an information processingapproach”, Else vier publication, 2004.
6. C.S.Raghavendra Krishna, M.Sivalingam and Tarib znati, “Wireless Sensor Networks”,Springer publication, 2004.
7. Holger Karl , Andreas willig, “Protocol and Architecture for Wireless Sensor Networks”, Johnwiley publication, Jan 2006.

8. 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.
9. Philip Levis, " TinyOS Programming", 2006 – www.tinyos.net.
10. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey",computer networks, Elsevier, 2002, 394 - 422.
11. Jamal N. Al-karaki, Ahmed E. Kamal, "Routing Techniques in Wireless sensor networks: A survey", IEEE wireless communication, December 2004, 6 – 28.

15MES159 NETWORK PROTOCOLS 3003

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 9

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 9

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 9

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 9

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 9

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: 45H

REFERENCES:

1. Javvin, “Network Protocols” , Javvin Technologies Inc , second edition, 2005
2. William Stallings, “Cryptography and Network Security”, PHI, 2000.
3. Mani Subramanian, “Network Management−Principles and Practices”, Addison Wesley,2000.
4. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, AddisonWesley, 1999.
5. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

15MES160 NETWORK ROUTING ALGORITHMS 3003

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 9

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 9

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 9

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 9

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 9

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: 45h

REFERENCES:

1. William Stallings, ‘ High speed networks and Internets Performance and Quality of Service’, IInd Edition, Pearson Education Asia. Reprint India 2002
2. M. Steen Strub, ‘ Routing in Communication network, Prentice –Hall International, Newyork,1995.
3. S. Keshav, ‘An engineering approach to computer networking’ Addison Wesley 1999.
4. William Stallings, ‘High speed Networks TCP/IP and ATM Design Principles, Prentice- Hall,New York, 1995
5. C.E Perkins, ‘Ad Hoc Networking’, Addison – Wesley, 2001
6. 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.
7. A.T Campbell et al., “ Comparison of IP Micromobility Protocols,” IEEE Wireless Communications Feb.2002, pp 72-82.
8. C.Siva Rama Murthy and Mohan Gurusamy, “ WDM Optical Networks – Concepts, Design and Algorithms”, Prentice Hall of India Pvt. Ltd, New Delhi –2002.

15MES161 SIGNAL PROCESSING TECHNIQUES FOR SPEECH RECOGNITION 3003

Course Objective:

- 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 **9**

Physiological and Mathematical Model-Relating the physiological and mathematical modelCategorization 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 **9**

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 **9**

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 9

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 9

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: 45h

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.
9. Thomas F. Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Pearson Education, 2008.
10. L. Rabiner and B. Juang, "Fundamentals of Speech Recognition", Prentice-Hall Signal Processing Series, 1993.

15MES162 OFDM and MIMO Communication Systems 3003

Course Objective:

- 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 9

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 9

Resource allocation and Scheduling algorithms – Synchronization in OFDMA downlink and uplink – Synchronization for WIMAX

UNIT III - ADAPTIVE MODULATION AND TRAINING SEQUENCE DESIGN 9

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 9

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 **9**

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: 45h

REFERENCES

1. Tao Jiang, Lingyang Song, and Yan Zhang, “Orthogonal Frequency Division Multiple Access (OFDMA) Fundamentals and Applications”, Auberbach Publications, Taylor & Francis Group, 2010.

2. Yi (Geoffrey) Li, and Gordon L. Stuber, “ Orthogonal Frequency Division Multiplexing”, Springer Science+Business Media Inc., NY, USA, 2006.

3. Tolga M. Duman and Ali Ghrayeb, “Coding for MIMO Communication systems”, John Wiley & Sons, West Sussex, England, 2007.

15MES163 Adaptive Signal Processing 3003

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 9

Review of Linear Algebra, and Discrete Random Processes for random signal processing, Parseval'sTheorem, Wiener Khintchine Relation - Power Spectral Density, Sum Decomposition Theorem, SpectralFactorization Theorem - Discrete Random Signal processing by Linear Systems - Low Pass Filtering of White Noise. Spectrum estimation

UNIT II - SPECTRUM ESTIMATION 9

Non-Parametric Methods, Estimators and its Performance Analysis, Periodogram and it's based nonparametric methods - Signal Modeling and it's Based Approach's - Parameter Estimation Using Yule- Walker Method.

UNIT III - LINEAR ESTIMATION AND PREDICTION 9

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 9

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 9

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: 45h

REFERENCES

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
3. John G.Proakis, Dimitris G.Manolakis, "Digital Signal Processing", Pearson Education, 2007.
4. B.Farhang-Boroujeny, "Adaptive Filters : Theory and Application", John Wiley and Sons Ltd, United Kingdom, 1998.
5. Simon Haykin , "Adaptive Filter Theory", 4/E, Pearson Education, South Asia, 2009.
6. Vaidyanathan P.P, "Multirate Systems and Filter Banks", Pearson Education, 2008.
7. Rafael C. Gonzalez, Richard E. Woods, " Digital Image Processing", Pearson Education Inc.,3/E, 2009.

15MES164 ADVANCED DIGITAL IMAGE PROCESSING 3003

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 9

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 9

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 9

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 9

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 9

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: 45 H

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.

15MES165 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 9+3

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 9+3

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 9+3

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 9+3

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 9+3

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 PERIODS

TEXT BOOK:

1. Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 40th Edition, 2007.

REFERENCES:

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.