DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

Syllabus

For

M.Tech. (Computer Science & Engineering)

(Effective from the Session: 2016-17)

Course structure and evaluation scheme for M.Tech Computer Science & Engineering
(Effective from the Session: 2016-17)

SEMESTER –I

S. No.	Subject Code	Name of Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
							CT	TA	ESE	TA	ESE	
1	MTCS101	Foundation of Computer Science	3	0	0	3	20	10	70	-----	-----	100
2	MTCS102	Advanced Algorithm	3	0	0	3	20	10	70	-----	-----	100
3	MTCS01?	Departmental Elective I	3	0	0	3	20	10	70			100
4	MTCS02?	Departmental Elective II	3	0	0	3	20	10	70	-----	-----	100
5		Research Process & Methodology	3	0	0	3	20	10	70	-----	-----	100
6	MTCS151	Lab-I: Foundation of computer Science	0	0	3	2		-----	-----	20	30	50
7	MTCS152	Lab-II: Advanced Algorithm	0	0	2	1	-----	-----	-----	20	30	50
		Total				18						600

SEMESTER –II

S. No.	Subject Code	Name of Subject	Periods			Credit	Evaluation Scheme					
							Theory			Practical		Subject Total
							CT	TA	ESE	TA	ESE	
1	MTCS201	Multi Core Architecture and Programming Multi Core Architecture and Programming	3	0	0	3	20	10	70	-----	-----	100
2	MTCS202	Wireless Mobile Networks	3	0	0	3	20	10	70	-----	-----	100
3	MTCS03?	Departmental Elective III	3	0	0	3	20	10	70			100
4	MTCS04?	Departmental Elective IV	3	0	0	3	20	10	70	-----	-----	100
5	MTCS05?	Elective V	3	0	0	3	20	10	70	-----	-----	100
6	MTCS251	Lab-III: Wireless & Mobile Networks	0	0	3	2		-----	-----	20	30	50
7	MTCS252	Seminar-I	0	0	2	1	-----	-----	-----	20	30	50
		Total				18						600

SEMESTER –III

S. No.	Subject Code	Name of Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTCS351	Seminar-II	0	0	6	3	-----	-----	-----	100	-----	100
2	MTCS352	Dissertation	0	0	30	15	-----	-----	-----	200	300	500
		Total				18	-----	-----	-----			600

SEMESTER –IV

S. No.	Subject Code	Name of Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTCS451	Dissertation(Final)	0	0	36	18	-----	-----	-----	200	400	600
		Total				18						600

Departmental Elective I

1. MTCS011: Software Requirements & Specifications
2. MTCS012: Software Process & Management
3. MTCS013: Cloud Computing
4. MTCS014: Embedded Systems
5. MTCS015: Advanced Database
6. MTCS016: Modeling and Simulation

Departmental Elective II

1. MTCS021: Sensor Network
2. MTCS022: Software Testing & Auditing
3. MTCS023: Real Time Systems
4. MTCS024: Data Warehousing & Data Mining
5. MTCS025: Genetic Algorithms
6. MTCS026: Neural Networks

Departmental Elective III-

1. MTCS031: Machine Learning
2. MTCS032: High Performance Networking
3. MTCS033: Software Metrics & Quality Assurance
4. MTCS034: Big Data Analytics
5. MTCS035: Cyber Security and Laws
6. MTCS036: Multimedia Systems

Departmental Elective IV

1. MTCS041: Distributed Databases
2. MTCS042: Software Project Planning & Management
3. MTCS043: Network Management
4. MTCS044: Robotics
5. MTCS045: Data Centre Management
6. MTCS046: Digital Forensics

Departmental Elective V

1. MTCS051: Optimization Techniques
2. MTCS052: Digital Image Processing
3. MTCS053: Professional Aspects in Software Engineering
4. MTCS054: Storage Area Network
5. MTCS055: Optical Networks
6. MTCS056: Advanced Data Modeling

FOUNDATION OF COMPUTER SCIENCE (MTCS101)

UNIT-I: DATA STRUCTURE
List, Stack, Queue, Tree, Hash Table, Graph, Search and Sorting Algorithms.

UNIT-II: OPERATING SYSTEM
Scheduling Algorithm, Synchronization Technique, Paging and Segmentation, Virtual Memory.

UNIT-III: AUTOMATA THEORY
Finite Automata, Regular Expression, Context Free Grammar, Push Down Automata, Turing Machine, P and NP Class.

UNIT-IV: DATABASE SYSTEM
Concepts and Architecture; Data Model; Normalization; SQL Advanced Transaction Processing, Deadlock and Concurrency Control; Object Oriented and Object Relational Databases: Parallel and Distributed Databases; Backup and Recovery Concepts, Emerging Database Technologies.

REFERENCES:

1.Hopcroft & Ullman, "Introduction to Automata Theory, Languages, and Computation", Narosa Publishing House.
2.Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Addison Wesley.
3.Dhamdhere, Öperating Systems", Tata McGraw Hill.
4.Aho, Ullman and Sethi, "Compiler Design", Addison Wesley.
5.Ramez Elmasri, Shamkant Navathe: Fundamentals of Database Systems, Fifth Edition, Pearson Education, 2007.
6.Raghu Ramakrishnan, Johannes Gehrke : Database Management Systems, Tata McGraw-Hill.
7. Alexis Lcon, Mathews Leon, "Database Management Systems
8. C.J. Date : An Introduction to Database Systems, Eighth Edition, Pearson Education.
9. Abraham Silberschatz, Henry F. Korth, S.Sudarshan: Database System Concepts, Tata McGraw-Hill.

ADVANCED ALGORITHM (MTCS102)

Algorithm Fundamentals: Basic Concept, Analysis of Algorithm, Growth of Functions, Master's Theorem.

Analysis of sorting Algorithms: Overview, Merge sort, Quick sort, Heap sort, radix sort.

Advance Data Structure: Red-Black Trees, B/B+ Trees.

Parallel Algorithm: Performance Measures of Parallel Algorithms, Parallel Merging/Sorting Algorithms on CREW/EREW, Parallel searching algorithms.

Advance Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Branch and ound, Back Tracking.

Graph Algorithm: DFS and BFS algorithm.
NP Complete Problem

REFERENCES:

1. Coreman, Rivest, Lisserson, "Algorithm", PHI.
2. Basse, "Computer Algorithms: Introduction to Design & Analysis",Addision Wesley.
3. Horowitz, Sahani, and Rajasekaran " Fundamental of Computer Algorithms", Universities Press

LAB-1: FOUNDATION OF COMPUTER SCIENCE (MTCS151)

1. **Implementation of** List , Stack, Queue,Tree,Hash Table, Graph, Search and Sorting Algorithms
2. **Implementation of** Scheduling Algorithm, Synchronization Technique, Paging and Segmentation, Virtual Memory.
3. **Implementation of** Finite Automata, Regular Expression, Context Free Grammar, Push Down Automata, Turing Machine, P and NP Class.
4. **Implementation of** – Phases, Lexical Analysis, Syntax and Semantic Analysis, Top Down and Bottom Up Parsing Techniques.

LAB-II: ADVANCED ALGORITHM (MTCS152)

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
2. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
3. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
4. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a) Preorder b) Inorder c) Postorder.
5. Write Java programs for the implementation of bfs and dfs for a given graph.
6. Write Java programs for implementing the following sorting methods: a) Bubble sort b) Insertion sort c) Quick sort d) Merge sort e) Heap sort f) Radix sort g) Binary tree sort
7. Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree
8. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
9. Write a Java program that implements KMP algorithm for pattern matching.

MULTI-CORE ARCHITECTURE & PROGRAMMING (MTCS201)

UNIT-I:

Introduction to Multi-core Architecture: Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. **System Overview of Threading:** Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

UNIT-II:

Fundamental Concepts of Parallel Programming: Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives.

UNIT- III:

Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features. **Threading APIs :** Threading APls for Microsoft Windows, Win32/MFC Thread APls, Threading APls for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

UNIT-IV:

OpenMP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance.

UNIT-V:

Solutions to Common Parallel Programming Problems: Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,Data Organization for High Performance.

REFERENCES:

1. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006

2 .Introduction to Parallel Processing ,Sashi Kumar,PHI
3. Parallel Programming, Wilkinson, Pearson
4. Elements of Parallel Computing, Rajaraman,PHI

WIRELESS AND MOBILE NETWORKS (MTCS202)

1. Introduction to Wireless and Mobile Networks

2. Wireless Transmission: Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum

3. Wireless Medium Access Control: Common Problems, SDMA, FDMA, TDMA, CDMA

4. Wireless Telecommunications Systems: GSM, DECT, TETRA, UMTS, IMT-2000, LTE

5. Satellite Systems: Introduction, Deficiencies of existing GEO/MEO/LEO Satellite Systems, Satellite Architectures, Satellite Routing, Satellite Channel Access, Satellite Handover, High Altitude Platforms, and Applications.

6. Wireless LAN: IEEE 802.11, Bluetooth, RFID, Security issues.

7. Mobile Network Layer I: Problems of IP in Wireless, Principles behind Mobile IP, Problems, Security issues, DHCP.

8. Mobile Network Layer II: Routing in Ad-hoc Networks, Wireless Sensor Networks

9. Mobile Transport Layer: Effects of mobility and wireless transmissions on reliable transport protocols such as TCP.

10. Support for Mobility: File Systems, databases, WWW and Mobility, WAP, Application layer for mobile networks.

REFERENCES:

1. J. Schiller, Mobile Communications, 2nd edition, Addison Wesley.
2. Wireless Communications and Networks, William Stallings, 2nd edition, Prentice Hall.

Lab-III: Wireless and Mobile Networks (MTCS251)

Tools:

1. **Wireshark**
2. **Cisco Packet Tracer**
3. **NS-2 / NS-3**
4. **OmNet++, OverSim**

Lab Exercises:

- The above mentioned tools can be used to experiment with Wireless Network.
- Different protocols can be implemented and tested using the tools viz. AODV, DSR, DSDV etc.
- Wireless topologies (WLAN) can be created for analysis and debugging purpose.
- Test-beds can be developed for testing and performance analysis purposes.

ELECTIVE-1

SOFTWARE REQUIREMENT AND SPECIFICATIONS (MTCS011)

UNIT-I: Basics of requirements Engineering

- Definition of requirements engineering.
- Importance of requirements engineering.
- Place of requirements engineering in development process.
- Types of requirements: functional requirements, non-functional requirements, quality attributes.
- Main requirements engineering activities, documents and processes.

UNIT-I: Requirements inception and elicitation

- Product vision and project scope.
- Traditional elicitation approaches (interviews, stakeholders study, workshops).
- Scenario/use case approaches.
- Prototyping.
- Requirements negotiation and risk management.

UNIT-III: Requirements analysis and specification - modeling techniques

- Inception vs. specification.
- Techniques for writing high-quality requirements.
- Documentation standards (e.g., IEEE 830-1998).
- Goal-oriented modeling.
- Structured analysis and other techniques.
- UML v2 and URN notations.
- External qualities management, contract specification.

UNIT-IV: Requirements verification and validation

- Detection of conflicts and inconsistencies, completeness.
- Techniques for inspection, verification and validation.
- Feature interaction analysis and resolution.

UNIT-V: Requirements management

- Traceability, priorities, changes, baselines.
- Tool support (e.g., DOORS).
- Requirements for various types of systems: embedded systems, consumer. Systems, web-based systems, business systems, systems for scientists and other engineers.
- Requirements engineering in RUP.
- Requirements engineering in agile methods.

REFERENCES:

1. Ian K. Bray, An Introduction to Requirements Engineering, Addison Wesley, 2002
2. Ian F. Alexander, Richard Stevens, Writing better requirements, Addison-Wesley, 2002

3. Elizabeth Hull, Ken Jackson, Jeremy Dick, Requirements Engineering, Springer-Verlag, 2004
4. Karl E. Wiegers, Software Requirements, Microsoft Press, 2003
5. Axel van Lamsweerde, Requirements Engineering: From System Goals to UML Models to Software Specifications, Wiley, 2009.
6. Ian Alexander and Ljerka Beus-Dukic, Discovering Requirements: How to Specify Products and Services, Wiley, 2010.
7. Klaus Pohl, Requirements Engineering - Fundamentals, Principles, and Techniques, Springer, 2010

SOFTWARE PROCESS & MANAGEMENT (MTCS012)

UNIT-I:
DEVELOPMENT LIFE CYCLE PROCESSES
Overview of software development life cycle – introduction to processes – Personal Software Process (PSP) – Team software process (TSP) – Unified processes – agile processes – choosing the right process Tutorial: Software development using PSP

UNIT-II:
REQUIREMENTS MANAGEMENT
Functional requirements and quality attributes – elicitation techniques – Quality Attribute Workshops (QAW) – analysis, prioritization, and tradeoff – Architecture Centric Development Method (ACDM) – requirements documentation and specification – change management – traceability of requirements Tutorial: Conduct QAW, elicit, analyze, prioritize, and document requirements using ACDM

UNIT-III:
ESTIMATION, PLANNING, AND TRACKING
Identifying and prioritizing risks – risk mitigation plans – estimation techniques – use case points – function points – COCOMO II – topdown estimation – bottomup estimation – work breakdown structure – macro and micro plans – planning poker – wideband delphi – documenting the plan – tracking the plan – earned value method (EVM) Tutorial: Estimation, planning, and tracking exercises

UNIT-IV:
CONFIGURATION AND QUALITY MANAGEMENT
identifying artifacts to be configured – naming conventions and version control – configuration control – quality assurance techniques – peer reviews – Fegan inspection – unit, integration, system, and acceptance testing – test data and test cases – bug tracking – causal analysis Tutorial: version control exercises, development of test cases, causal analysis of defects

UNIT-V:
SOFTWARE PROCESS DEFINITION AND MANAGEMENT
Process elements – process architecture – relationship between elements – process modeling – process definition techniques – ETVX (entrytaskvalidationexit) – process baselining – process assessment and improvement – CMMI – Six Sigma Tutorial: process measurement exercises, process definition using ETVX

REFERENCES:
1. Pankaj Jalote, “Software Project Management in Practice”, Pearson, 2002.

2. Chris F. Kemerer, "Software Project Management – Readings and Cases", McGraw Hill, 1997.
3. Watts S. Humphrey, "PSP: A selfimprovement process for software engineers", AddisonWesley, 2005.
4. Watts S. Humphrey, "Introduction to the Team Software Process", AddisonWesley, 2000.
5. Orit Hazzan and Yael Dubinsky, "Agile software engineering", Springer, 2008.
6. James R. Persse, "Process Improvement Essentials", O'Reilly, 2006.
7. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw Hill, 2010.

CLOUD COMPUTING (MTCS013)

UNIT-I:

Overview of Computing Paradigm

Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computing Business driver for adopting cloud computing

Introduction to Cloud Computing Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics & Disadvantages Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards

UNIT-II:

Cloud Computing Architecture Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS) , Platform as a Service(PaaS), Software as a Service(SaaS) Deployment Models Public cloud, Private cloud, Hybrid cloud, Community cloud

UNIT-III:

Infrastructure as a Service(IaaS) Introduction to IaaS IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) Resource Virtualization Server, Storage, Network Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service) Examples Amazon EC2 Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus

Platform as a Service(PaaS) Introduction to PaaS What is PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage Examples Google App Engine Microsoft Azure

Software as a Service (PaaS) Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS

UNIT-IV:

Service Management in Cloud Computing Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability & Cloud Services Database & Data Stores in Cloud Large Scale Data Processing

UNIT-V:

Cloud Security Infrastructure Security Network level security, Host level security, Application level security Data security and Storage Data privacy and security Issues, Jurisdictional issues raised by Data location Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

REFERENCES:

- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
- Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
- Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

EMBEDDED SYSTEMS (MTCS014)

UNIT -I

Introduction: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT -III:

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

REFERENCES:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
2. Embedded Systems - Raj Kamal, TMH.
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
4. Embedded Systems – Lyla, Pearson, 2013
5. An Embedded Software Primer - David E. Simon, Pearson Education.

ADVANCED DATABASE (MTCS015)

UNIT-I:

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, other Models, Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER Diagrams, Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views, Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers.

UNIT-II:

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms, BCNF, Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design, Multi valued Dependencies, FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT-III:

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock Based Concurrency Control, Deadlocks, Performance of Locking, Transaction Support in SQL.

Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery.

UNIT-IV:

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Clustered Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing

Storing data: Disks and Files: -The Memory Hierarchy, Redundant Arrays of Independent Disks.

Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM)

B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.

UNIT-V:

Distributed databases: Introduction to distributed databases, Distributed DBMS architectures, Storing data in a distributed DBMS, Distributed catalog management, Distributed query processing Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed Recovery.

REFERENCES:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.

2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition, 2006.
3. Fundamentals of Database Systems 5th edition. Ramez Elmasri, Shamkant B.Navathe, Pearson Education, 2008.
4. Introduction to Database Systems, C.J.Date,Pearson Education.
5. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
6. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.

MODELING AND SIMULATION (MTCS016)

UNIT-I:
Introduction: Systems, models, deterministic and stochastic systems, static and dynamic systems, discrete event simulation, continuous simulation, Monte Carlo simulation.Discrete Event Simulation: Time-advance mechanisms, event modeling of discrete dynamic systems, event graphs, process oriented and event oriented approaches, single-server single queue model.

UNIT-II:
GPSS: Program model, entities and transactions, blocks in GPSS, user defined functions, SNA, logic switches, save locations, user chains, tabulation of result, programming examples. Random Number Generation: Congruence generators, long period generators, statistical quality measures of generators, uniformity and independence testing, chi-square and other hypotheses testing, runs testing

UNIT-III:
Random Variable Generation: random variable, probability density and distribution functions, Location, scale and shape parameters, discrete and continuous probability distributions; Inverse transform method, composition and acceptance-rejection methods, efficiency and quality measures of generators; Input Modelling, selection of distribution for a random source, fitting distributions to data, constructing empirical distributions from data.

UNIT-IV:
Random Processes and Queuing Models: random process, discrete/continuous time processes, Markovian property, Markov chain, state transition diagrams, birth-death process, Little's theorem, steady state analysis of M/M/1 model; multi-server models, M/G/1 and other queuing models, Burke's theorem, network of queues, Jackson theorem.

UNIT-V:
Network Simulation: SimEvent tool box in MATLAB, general features of network simulation packages, case study of OMNET++/ns2/ns3/NetSim.

REFERENCES:
1. Network Simulation: SimEvent tool box in MATLAB, general features of network simulation packages, case study of OMNET++/ns2/ns3/NetSim.
2. Banks, J., Carson, L.S., Nelson, B.L. and Nicol, D.M., "Discrete Event System Simulation", 4th Ed., Pearson Education
3. Law, A.M. and Kelton, W.D., "Simulation, Modeling and Analysis", 3rd Ed., Tata McGraw-Hill.
4. Alberto Leon-Garcia, "Probability and Random Processes for Electrical Engineers", 2nd Ed., Pearson Education

ELECTIVE-II

SENSOR NETWORK:- (MTCS021)

UNIT-I:

Basics of wireless sensor networks

Some Foundational Information of WSN, Next-Generation Sensor Networked Tiny Devices Sensor Network Software, Unique Characteristics of Programming Environments for Sensor Network Future Demands on Sensor-Based Software Sensor Network Applications Characteristics of Sensor Networks, Nature of Data in Sensor Networks Overview of IEEE 802.15.4 and ZigBee.

UNIT-II:

Medium Access Control Protocols for Wireless Sensor Networks

Introduction, Background Fundamentals of MAC Protocols MAC Protocols for WSNs: Schedule-Based Protocols and Random Access-Based Protocols Sensor-MAC: Protocol Overview, Periodic Listen and Sleep Operations, Schedule Selection and Coordination, Schedule Synchronization, Adaptive Listening, Access Control and Data Exchange (B-MAC,H-MAC, I-MAC, O-MAC, S-MAC. Ri-MAC, T-MAC, Q-MAC (Query MAC), Q-MAC (QoS MAC), X-MAC)

UNIT-III:

Routing Protocols for Wireless Sensor Networks

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

UNIT-IV:

Transport Control Protocols and Operating Systems for WSN

Traditional Transport Control Protocols: TCP (RFC 793), UDP (RFC 768), Mobile IP Feasibility of Using TCP or UDP for WSNs Introduction of Operating Systems Examples of Operating Systems: Tiny OS, Mate, Magnet OS

UNIT-V:

Network Management for Wireless Sensor Networks

Introduction, Network Management Requirements Traditional Network Management Models Simple Network Management Protocol Telecom Operation Map Network Management Design Issues Example of Management Architecture: MANNA Other Issues Related to Network Management, Naming, Localization, Sensor Network Application Case Studies.

REFERENCES:

1. Algorithms for Sensor and Ad Hoc Networks, Advanced Lectures, Lecture Notes in Computer Science 4621, Editors Dorothea Wagner and Roger Wattenhofer, 2007.
2. Fundamentals of Wireless Sensor Networks: Theory and Practice Waltenegus Dargie, Christian Poellabauer John Wiley & Sons, 2010

3. Ad Hoc and Sensor Networks: Theory and Applications Carlos De Morais Cordeiro, Dharma Prakash Agrawal World Scientific, 2011

SOFTWARE TESTING AND AUDITING: (MTCS022)

UNIT-I: TESTING BASICS

Testing as an engineering activity – Role of process in software quality – Testing as a process – Basic definitions – Software testing principles – The tester's role in a software development organization – Origins of defects – Defect classes – The defect repository and test design – Defect examples – Developer / Tester support for developing a defect repository.

UNIT-II: TEST CASE DESIGN

Introduction to testing design strategies – The smarter tester – Test case design strategies – Using black box approach to test case design – Random testing – Equivalence class partitioning – Boundary value analysis – Other black box test design approaches – Black box testing and COTS – Using white box approach to test design – Test adequacy criteria – Coverage and control flow graphs – Covering code logic – Paths – Their role in white box based test design – Additional white box test design approaches – Evaluating test adequacy criteria.

UNIT-III: LEVELS OF TESTING

The need for levels of testing – Unit test – Unit test planning – Designing the unit tests – The class as a testable unit – The test harness – Running the unit tests and recording results – Integration tests – Designing integration tests – Integration test planning – System test – The different types – Regression testing – Alpha, beta and acceptance tests.

UNIT-IV: TEST MANAGEMENT -CONTROLLING AND MONITORING

Basic concepts – Testing, debugging goals, policies – Test planning – Test plan components – Test plan attachments – Locating test items – Reporting test results – The role of three groups in test planning and policy development – Process and the engineering disciplines – Introducing the test specialist – Skills needed by a test specialist – Building a testing group. Defining terms – Measurements and milestones for controlling and monitoring – Status meetings – Reports and control issues – Criteria for test completion – SCM – Types of reviews – Developing a review program – Components of review plans – Reporting review results.

UNIT-V: AUDITING

Software audit review, software audits Vs software peer reviews and software management reviews. **Objectives and participants** Initiator, Lead Auditor, Recorder, Auditors, Audited Organization.

REFERENCES:

1. SrinivasanDesikan, Gopalaswamy Ramesh, "Software Testing: Principles and Practices", Pearson 2012
2. Aditya P. Mathur, "Foundations of Software Testing", Pearson, 2008
3. Paul Ammann, Jeff Offutt, "Introduction to Software Testing", Cambridge University Press, 2008
4. Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", Auerbach Publications, 2008
5. *IEEE Standard for Software Reviews*, clause 3.2

REAL TIME SYSTEMS (MTCS023)

UNIT-I:

Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:

Real Time Scheduling Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:

Resources Sharing: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:

Real Time Communication Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.

UNIT-V:

Real Time Operating Systems and Databases Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

REFERENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

DATA WAREHOUSING & DATA MINING (MTCS024)

UNIT-I:
Data Warehousing and Business Analysis: - Data warehousing Components, Building a Data warehouse, Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support, Data Extraction, Cleanup, and Transformation Tools, Metadata reporting, Query tools and Applications, Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT-II:
Data Mining: - Data Mining Functionalities – Data Preprocessing, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.
Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules, Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT-III:
Classification and Prediction: - Issues Regarding Classification and Prediction, Classification by Decision Tree Introduction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor , Ensemble Methods, Model Section.

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

UNIT-V:
Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

REFERENCES:

1. Jiawei Han and Micheline Kamber "Data Mining Concepts and Techniques" Second Edition,
2. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.
5. Soman K.P., Shyam Diwakar and V. Ajay, "*Insight into Data mining Theory and Practice*", Easter Economy Edition, Prentice Hall of India, 2006.
6. Daniel T.Larose, "*Data Mining Methods and Models*", Wile-Interscience, 2006.

GENETIC ALGORITHMS (MTCS025)

UNIT-I:

Introduction: Robustness of Traditional Optimization and Search Methods, The goals of Optimization, How are Genetic Algorithms Different from Traditional Methods?, A simple genetic algorithm, Genetic algorithms at work – a simulation by hand, Grist for the Search Mill – important similarities, Similarity templates (Schemata), Learning the Lingo.

UNIT-II:

Genetic Algorithms Revisited: Mathematical Foundations – Who shall live and who shall die? The fundamental theorem, Schema Processing at work: An example by hand revisited, the two-armed and K-armed bandit problem, How many schemata are processed usefully?, The building block hypothesis, another perspective: the minimal Deceptive problem, Schemata revisit: similarity templates as hyper planes.

UNIT-III:

Computer Implementation Of A Genetic Algorithm – Data structures, reproduction, crossover, and mutation, A time to reproduce, a time to cross, get with the main program, How well does it work? Mapping objective functions to fitness form, fitness scaling, codings, a multiparameter, mapped, fixed-point coding, discretization, Constraint Handling.

UNIT-IV:

Techniques In Genetic Search – Dominance, diploidy and abeyance, inversion and other reordering operators, other micro operators, niche and speciation, multiobjective optimization - Knowledge-based techniques, genetic algorithms and parallel processors.

UNIT-V:

Multi objective evolutionary optimization: Pareto optimality, multi-objective evolutionary algorithms: MOGA, NSGA-II, etc. Applications of GA in engineering problems, job-shop scheduling and routing problems

REFERENCES:

1. David E.Goldberg, "Genetic Algorithms" – 1/e, Pearson Education.
2. Genetic algorithms in search, optimization and Mechine learning, By David E. Gold Berg Pearson Edition
3. An Introduction to Genetic Algorithm by Melanie Mitchell
4. The Simple Genetic Algorithm Foundation & Theores by Michael P. Vosk

NEURAL NETWORKS (MTCS026)

UNIT-1:
Basics of ANN: Models to Neuron; Basic learning laws. Activation and Synaptic Dynamics: Activation dynamics models; Synaptic dynamics models; Stability and Convergence.

UNIT-II:
Analysis of Feed forward Neural Networks: Linear associative networks for pattern association; Single layer and Multilayer Perception network for pattern classification; Multilayer feed forward neural networks for pattern mapping.

UNIT-III:
Analysis of Feedback Neural Networks: Linear auto associative networks; Hopfield model for pattern storage; stochastic networks; Boltzmann machine for pattern environment storage.

UNIT-IV:
Competitive Learning Neural Networks: Basic competitive learning laws; Analysis of pattern clustering networks; Analysis of self-organizing feature mapping networks.

UNIT-V:
Applications of ANN: Pattern classification problems; Optimization; Control.

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI

ELECTIVE-III

MACHINE LEARNING (MTCS031)

UNIT-I:

INTRODUCTION – Well defined learning problems, Designing a Learning System, Issues in Machine Learning;

THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias

UNIT-II:

DECISION TREE LEARNING - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning;

ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation Algorithm-Convergence, Generalization;

UNIT-III:

EVALUATING HYPOTHESES – Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms;

BAYESIAN LEARNING – Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm;

UNIT-IV:

COMPUTATIONAL LEARNING THEORY – Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning;

INSTANCE-BASED LEARNING – k-Nearest Neighbor Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning

UNIT-V:

GENETIC ALGORITHMS – an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL;

REINFORCEMENT LEARNING - The Learning Task, Q Learning.

REFERENCES:

1. Tom.M.Mitchell, Machine Learning, McGraw Hill International Edition
2. Ethern Alpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005.
3. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

HIGH PERFORMANCE NETWORKING (MTCS032)

UNIT-1:

Switching Networks: Switching – Packet switching - Ethernet, Token Ring, FDDI, DQDB, Frame Relay, SMDS, Circuit Switched – SONET, DWDM, DSL, Intelligent Networks – CATV, ATM – Features, Addressing, Signaling & Routing, Header Structure, ATM Adaptation layer, Management control, BISDN, Internetworking with ATM.

UNIT-2:

Multimedia Networking Applications : Streaming stored Audio and Video, Best effort service, protocols for real time interactive applications, Beyond best effort, scheduling and policing mechanism, integrated services, RSVP- differentiated services.

UNIT-3

Advanced Networks Concepts: VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN. MPLS operation, Routing, Tunneling and use of FEC, Traffic Engineering, and MPLS based VPN, overlay networksP2P connections.-IPv4vs V6.

UNIT-4:

Packet Queues And Delay Analysis: Little□s theorem, Birth and Death process, queueing discipline- Control & stability -, Markovian FIFO queueing system, Non-markovian - Pollaczek-Khinchin formula and M/G/1, M/D/1, self-similar models and Batch-arrival model, Networks of Queues – Burke□s theorem and Jackson Theorem.

UNIT-5:

Network Security And Management: Principles of cryptography – Elliptic-AES-Authentication – integrity – key distribution and certification– Access control and: fire walls – DoS-attacks and counter measures – security in many layers.Infrastructure for network management – The internet standard management framework – SMI, MIB,SNMP, Security and administration – ASN.1.

REFERENCES:

1. Aunurag Kumar, D. Manjunath, Joy Kuri, "Communication Networking", MorganKaufmann Publishers, 2011.
2. J.F. Kurose & K.W. Ross, "Computer Networking- A Top Down Approach Featuring the Internet", Pearson, 2nd Edition, 2003.
3. Nader F.Mir, "Computer and Communication Networks", Pearson Education, 2009.
4. Walrand .J. Varatya, "High Performance Communication Network", Morgan Kaufmann – Harcourt Asia Pvt. Ltd., 2nd Edition, 2000.
5. Hersent Gurle & petit, "IP Telephony, Packet Pored Multimedia Communication Systems", Pearson Education 2003.
6. Fred Halsall and Lingana Gouda Kulkarni, "Computer Networking and the Internet", Fifth Edition, Pearson Education, 2012.
7. Larry L.Peterson & Bruce S.David, "Computer Networks: A System Approach"- Morgan Kaufmann Publisher, 1996.

SOFTWARE METRICS AND QUALITY ASSURANCE (MTCS033)

UNIT-I:
What Is Software Quality: Quality: Popular Views, Quality Professional Views, Software Quality, Total Quality Management and Summary. Fundamentals Of Measurement Theory: Definition, Operational Definition, And Measurement, Level Of Measurement, Some Basic Measures, Reliability And Validity, Measurement Errors, Be Careful With Correlation, Criteria For Causality, Summary. Software Quality Metrics Overview: Product Quality Metrics, In Process Quality Metrics, Metrics for Software Maintenance, Examples For Metrics Programs, Collecting Software Engineering Data.

UNIT-II:
Applying The Seven Basic Quality Tools In Software Development: Ishikawa's Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause And Effect Diagram. The Rayleigh Model: Reliability Models, The Rayleigh Model Basic Assumptions, Implementation, Reliability And Predictive Validity.

UNIT-III:
Complexity Metrics And Models: Lines Of Code, Halstead's Software Science , Cyclomatic Complexity Syntactic Metrics, An Example Of Module Design Metrics In Practice .Metric And Lessons Learned For Object Oriented Projects: Object Oriented Concepts And Constructs, Design And Complexity Metrics, Productivity Metrics, Quality And Quality Management Metrics, Lessons Learned For object oriented Projects.

UNIT-IV:
Availability Metrics: Definition And Measurement Of System Availability, Reliability Availability And Defect Rate, Collecting Customer Outage Data For Quality Improvement, In Process Metrics For Outage And Availability .Conducting Software Project Assessment :Audit Ad Assessment , Software Process Maturity Assessment And Software Project Assessment , Software Process Assessment A Proponed Software Project Assessment Method.

UNIT-V:
Dos And Don'ts Of Software Process Improvement :Measuring Process Maturity, Measuring Process Capability, Staged Versus Continuous Debating Religion, Measuring Levels Is Not Enough, Establishing The Alignment Principle , Take Time Getting Faster, Keep it Simple Or Face Decomplexification, Measuring The Value Of Process Improvement , Measuring Process Compliance , Celebrate The Journey Not Just The Destination. Using Function Point Metrics to Measure Software Process Improvement: Software Process Improvement Sequences, Process Improvement Economies, Measuring Process Improvement at Activity Levels.

REFERENCES:
1. Stephen H Khan: Metrics and Models in Software Quality Engineering, Pearson 2nd edition 2013.
2. Norman E-Fentor and Share Lawrence Pflieger." Software Metrics". International Thomson Computer Press, 1997.
3. S.A.Kelkar,"Software quality and Testing, PHI Learing, Pvt, Ltd., New Delhi 2012.
4. Watts S Humphrey, "Managing the Software Process", Pearson Education Inc, 2008.
5. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, "CMMI", Pearson Education(Singapore) Pte Ltd, 2003
6. Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.

BIG DATA ANALYTICS (MTCS034)

UNIT-I:
INTRODUCTION TO BIG DATA: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications.

UNIT-II:
BIG DATA TECHNOLOGIES: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

UNIT-III:
PROCESSING BIG DATA: Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

UNIT-IV:
HADOOP MAPREDUCE: Employing Hadoop Map Reduce, Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT-V:
BIG DATA TOOLS AND TECHNIQUES: Installing and Running Pig, Comparison with Databases, Pig Latin, User- Define Functions, Data Processing Operators, Installing and Running Hive, Hive QL, Querying Data, User-Defined Functions, Oracle Big Data.

REFERENCES:

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.1. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012
3. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014
4. Barlow, M., Real-Time Big Data Analytics: Emerging Architecture, O Reilly, 2013
5. Schonberger, V.M. , Kenneth Cukier, K., Big Data, John Murray Publishers, 2013
6. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

CYBER SECURITY AND LAWS (MTCS035)

UNIT-I:

Introduction: Review of TCP/IP and TCP, IP Header analysis, Introduction to Cyber World, Cyber attacks and cyber security, Information warfare and cyber terrorism, Types of cyber attacks, Cyber Crime and Digital Fraud, Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)

UNIT-II:

Issues in cyber security: Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

UNIT-III:

Intellectual property rights: Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT-IV:

Procedural Issues Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT-V:

Legal aspects of cyber security: Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

REFERENCES:

1. Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997.
2. D. Bainbridge, Introduction to Computer Law, 5th Edition, Pearson Education, 2004.
3. P. Duggal, Cyber Law: The Indian Perspective, Saakshar Law Publications, 2005.
4. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge University Press, 2006.
5. S.P. Tripathy, "Cyber security", Wiley Publications.

MULTIMEDIA SYSTEMS (MTCS036)

UNIT-I:

Introduction: Concept of Multimedia, Media & data stream, main properties of multimedia system, Data stream characteristics &for continuous media Multimedia Applications, Hardware Software requirements, Storage Technologies: RAID, Optical Media.

UNIT-II:

Components of multimedia and file formats: Text, Basic sound concepts , MIDI , Speech ,Basic concept of Images, Graphics format ,Basic concepts of Video & animation, Conventional system, Computer based animation, Authoring Tools, Categories of Authoring Tools.

UNIT-III:

Compression Techniques: Lossless and Lossy compression, Run length coding, Statistical Coding, Transform Coding, JPEG, MPEG, Text compression using static Huffmann technique, Dynamic Huffmann Technique, Arithmetic Technique.

Animation: Introduction, Basic Terminology techniques, tweaning & morphing, Motion Graphics 2D & 3D animation

UNIT-IV:

Multimedia Communication: Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications – Streaming of Audio and Video – Jitter – Fixed playout and Adaptive playout – Recovering from packet loss – RTSP — Multimedia Communication Standards – RTP/RTCP – SIP and H.263

UNIT-V:

Wireless Multimedia Communication: End to End QoS provisioning in Wireless Multimedia Networks – Adaptive Framework – MAC layer QoS enhancements in Wireless Networks – A Hybrid MAC protocol for 10 Multimedia Traffic – Call Admission Control in Wireless Multimedia Networks – A Global QoS Management for Wireless Networks

REFERENCES:

1. David Hillman, “Multimedia Technology & Applications”, Galgotia Publications, 2000
2. Nigel Chapman & Jenny Chapman, “Digital Multimedia”, Wiley Publications, 2000 2. D.P. Mukherjee, “Fundamentals of Computer Graphics and Multimedia”, PHI, 2001
3. Nalin K Sharda, ‘Multimedia Information Networking’, Prentice Hall of India, 1999
4. Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, ‘Multimedia Wireless Networks: Technologies, Standards and QoS’, Prentice Hall, 2003.
5. Ellen Kayata Wesel, ‘Wireless Multimedia Communications: Networking Video, Voice and Data’, Addision Wesley, 1998

ELECTIVE-IV

DISTRIBUTED DATABASE (MTCS041)

UNIT-I:
Introduction**:** Features of Distributed databases, Features of Centralized databases, Level of Distributed Transparency, Reference Architecture, Types of Data Fragmentation, Distribution Transparency, access primitives, integrity constraints in Distributed Database.

UNIT-II:
DISTRIBUTED DATABASE DESIGN: Framework for Distributed Database Design, Database Fragmentation Design - horizontal fragmentation, vertical fragmentation, Allocation of Fragments, allocation problem, allocation model, Translation of Global Queries to Fragment Queries, The Equivalence Transformation for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping, Aggregate Function Evaluation, Parametric Queries, Database Integration, Schema Matching, Schema Integration, Schema Mapping.

UNIT-III:
QUERY DECOMPOSITION AND DATA LOCALIZATION: Overview of Query Processing objectives, Characterization of Query Processors, Layers of Query Processing, Query Decomposition and Data Localization, Localization of Distributed Data, Optimization of Distributed Queries, Centralized Query Optimization, Join Ordering in Distributed Queries, Distributed Query Optimization.

UNIT-IV:
DISTRIBUTED TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL:
Introduction to Transaction Management, Properties of Transactions, Types of Transactions, Distributed Concurrency Control, Taxonomy of Concurrency Control Mechanisms, Locking - Based Concurrency Control Algorithms, Timestamp Based Concurrency Control Algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management, The System R * The Architecture of System R*, Compilation, Execution and Recompilation of Queries, Protocols for Data Definition and Authorization in R*, Transaction and Terminal Management.

UNIT-V:
RELIABILITY AND REPLICATION: Distributed DBMS Reliability, Reliability Concepts and Measures, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols, Data Replication, Consistency of Replicated Databases, Update Management Strategies, Replication Protocols.

REFERENCES:

1. Stefano Ceri, Guiseppe Pelagatti, "*Distributed Databases - Principles and Systems*", Tata McGraw Hill, 2008.
2. Ozsu M.T./ Sridhar S., "*Principles of Distributed database systems*", Pearson education, 2011.
3. Raghu RamaKrishnan, Johnaas Gehrke, "*Database Management Systems*", Tata McGrawHill, 2000.
4. Elmasri, Navathe, "*Fundamentals of Database Systems*", Addison-Wesley, Fifth Edition 2008.
5. Peter Rob, Carlos Coronnel, "*Database Systems- Design, Implementation and Management*", Course Technology, 2000.

SOFTWARE PROJECT PLANNING & MANAGEMENT (MTCS042)

UNIT-I:

Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, Common Pitfalls to watch out for in Metrics Programs, Matrices implementation checklists and tools, **Software configuration management:** Introduction, Some Basic Definitions and terminology, the processes and activities of software configuration management, configuration status accounting, configuration audit, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation.

UNIT-II:

Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management. **Project Planning and Tracking:** Components of Project Planning and Tracking, The "What " Part of a Project Plan, The "What Cost " Part of a Project Plan, The "When " Part of Project Planning, The "How " Part of a Project Planning: Tailoring of Organizational Processes For the Project, The " By Whom " Part of the Project Management Plan : Assigning Resources, Putting it all together : The Software Management Plan, Activities Specific to Project Tracking, Interfaces to the Process Database. **Project Closure:** When Does Project Closure Happen?. Why Should We Explicitly do a Closure?, An Effective Closure Process, Issues that Get Discussed During Closure, Metrics for Project Closure, Interfaces to the Process Database.

UNIT-III:

Software Requirements gathering: Inputs and start criteria for requirements gathering, Dimensions of requirements gathering, Steps to be followed during requirements gathering, outputs and quality records from the requirements phase, skill sets required during requirements phase, differences for a shrink-wrapped software, challenges during the requirements management phase, Metrics for requirements phase. **Estimation:** What is Estimation? when and why is Estimation done?, the three phases of Estimation, Estimation methodology, formal models for size Estimation, Translating size Estimate into effort Estimate, Translating effort Estimates into schedule Estimate, common challenges during Estimation , Metrics for the Estimation processes. **Design and Development Phases:** Some differences in our chosen approach, salient features of design, evolving an architecture/ blueprint, design for reusability, technology choices/ constraints, design to standards, design for portability, user interface issues, design for testability, design for diagnose ability, design for maintainability, design for install ability, inter-operability design, challenges during design and development phases, skill sets for design and development, metrics for design and development phases.

UNIT-IV:

Project management in the testing phase: Introduction, What is testing?, what are the activities that makeup testing?, test scheduling and types of tests, people issues in testing, management structures for testing in global teams, metrics for testing phase. **Project management in the Maintenance Phase:** Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people

resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.

UNIT-V:

Globalization issues in project management: Evolution of globalization, challenges in building global teams, Models for the execution of global projects, some effective management techniques for managing global teams. **Impact of the internet on project management:** Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. **People focused process models:** Growing emphasis on people centric models, people capability maturity model(P-CMM), other people focused models in the literature, how does an organization choose the models to use?

REFERENCES:

1. Ramesh Gopalaswamy: "Managing Global Projects ", Tata McGraw Hill, 2013.
2.Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000
3. Pankaj Jalote, "Software Project Management in practice", Pearson Education, New Delhi, 2002.

NETWORK MANAGEMENT (MTCS043)

UNIT – I:

Data communications and Network Management Overview : Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT – II:

SNMPV1 Network Management: Organization and Information and Information Models. Managed network : Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.
SNMPv1 Network Management: Communication and Functional Models. The SNMP Communication Model, Functional model.
SNMP Management: SNMPv2: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility With SNMPv1.
SNMP Management: RMON : What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT – III:

Telecommunications Management Network: Why TMN? , Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, mplementation Issues.

UNIT – IV:

Network Management Tools and Systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.

UNIT – V:
Web-Based Management: NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, WebBased Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network: , Future Directions.

REFERENCES:

1. Network Management: Principles and Practice; by Mani Subramanian; Addison Wesley; 2000; ISBN 0-201-35742-9
2. The Cuckoo's Egg : Tracking a Spy Through the Maze of Computer Espionage;by Clifford Stoll;Pocket Books;ISBN 0671726889
3. A. Clemm, "Network Management Fundamentals", Cisco Press, ISBN-13 978-1-58720-137-0

ROBOTICS (MTCS044)

UNIT-I:
INTRODUCTION Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems- Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems- Hydraulic, Pneumatic and Electric system.

UNIT-II:
END EFFECTORS AND ROBOT CONTROLS Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.

UNIT-III:
ROBOT TRANSFORMATIONS AND SENSORS Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.

UNIT-IV:
ROBOT CELL DESIGN AND APPLICATIONS Robot work cell design and control-Sequence Control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications-Material handling, Machine loading and unloading, assembly, Inspection,Welding, Spray painting and undersea robot.

UNIT-V:
MICRO/NANO ROBOTICS SYSTEM Micro/Nanorobotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nanorobot in targeted drug delivery system.

REFERENCES:

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,2009.
4. Francis N. Nagy, Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987.
5. P.A. Janaki Raman, Robotics and Image Processing an Introduction, Tata McGraw Hill Publishing company Ltd., 1995.
6. Carl D. Crane and Joseph Duffy, Kinematic Analysis of Robot manipulators, Cambridge University press, 2008.
7. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987
8. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley, 1999.
9. Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc.,1985.
10. Bharat Bhushan., "Springer Handbook of Nanotechnology", Springer, 2004.
11. Julian W. Gardner., "Micro sensor MEMS and Smart Devices", John Wiley & Sons, 2001

DATA CENTRE MANAGEMENT (MTCS045)

UNIT-1: AN INTRODUCTION TO THE DATA CENTRE

The purpose of this unit is to explain the basics of the history of the data centre, whybusinesses build them and how various designs are classified . The student should understand

1.1. Understand the history of the data centre, from its humble beginnings as a computer room to the football field sized behemoths of today.

1.2. Understand the critical services data centres provide and how they are embedded across most things we do throughout a typical day without us knowing.

1.3. Understand the important role data centres play and how they enable thedigital, and likely low carbon economy, of the future.

1.4. Describe and explain the most used definitions in the data centre industry.

1.6. Explain the market forces that are shaping the industry and how they are impacting today's designs.

1.7. Understand the design process and how criticality, the importance/impact of downtime, and the needs of the business informs the design.

UNIT-2: SITE SELECTION AND ENVIRONMENTAL CONSIDERATIONS, AND ARCHITECTURE DESIGN AND STANDARDS

The purpose of this unit is to help the candidate comprehend what should be taken into account when selecting the location for a data centre. Specifically, candidates must be able to:

2.1. Understand the standards recommendations.

2.2. Explain how the availability of resources affects a design, including power, connectivity and water.

2.3. Understand how geography influences the location of a data centre, including air-quality and localised risks.

2.4. Align design and architecture to business strategy today and into the future.

2.5. Business impact of decisions – looking at design from a TCO perspective over lifecyclefor External Shell design, Space considerations, Structural Specifications.

2.6. Applicable Standards – including fire resistance, fire suppression and security, etc.

2.7 Codes & Regulations – including legislative requirements across different countries

2.8. Other types of data centre design – covering modular data centres, scalable data centres, container based systems, fast provisioning, pre-fabricated data centresetc.

UNIT-3: IT HARDWARE

The purpose of this unit is to help candidates understand the terminology and technology of the IT hardware to be housed in a data centre. Specifically, candidates must be able to:

3.1. Identify the roles and terminologies of servers.

3.2. Understand the issues surrounding low server utilisation and the benefits of virtualisation.

3.3. Understand the various types of storage equipment.

3.4. Understand the various types of communications equipment.

3.5. Be aware of technology developments, today's challenges and the associated standards & regulations around IT hardware

3.6. Understand provisioning guidelines associated with IT, and how they affect managing data centre capacity.

3.7. case study of innovative designs – Google, Facebook, Yahoo, Deutsche Bank, Kyoto cooling, eBay.

UNIT-4: COOLING SYSTEM OPTIONS &ELECTRICAL POWER SYSTEMS

The purpose of this unit is to help the candidate to comprehend cooling in the context of the data centre and about electrical power systems. Specifically, candidates must be able to:

4.1. Demonstrate knowledge of the fundamentals of cooling.

4.2. Understand what cooling options are available and the advantages\disadvantages of each method, especially with respect to risk management.
4.3. Understand different monitoring and control strategies including associated benefits.
4.4. Understand how to make cooling systems more efficient – understand CoP/EER and operational efficiency across the whole lifecycle of the data centre including apart load efficiency.
4.5. Identify what is meant by power quality for the ICT load and understand the ITIC/CBEMA Power Quality Curve.
4.6. Explain the term 'grid power supply'.
4.7. Identify the various types of UPS including scalable & modular designs for energy efficiency and eco-mode operation.
4.8. Identify the various forms of energy storage, particularly battery and flywheel, and understand the limitations of each. Understand how power can be distributed in the data centre.
4.9. Explain standby/backup power and understand emerging technologies in thisarea – including fuel cell technologies.
4.10. Renewable power – low carbon generation and its applicability to the modern data centre.

UNIT-5: ROOM LAYOUT& FIRE PROTECTION AND SECURITY SYSTEMS

The purpose of this unit is to explain the importance of a room layout and fire protection in the context of the data centre.
5.1 Identify IT cabinet types and their installation – including rack mount and blade configurations.
5.2. Explain what is a hot aisle/cold aisle configuration and understand the benefits of air management.
5.3. Future considerations aligned to IT roadmap, including liquid cooled servers.
5.4. Explain the importance of fire regulations, how to prevent fire and identify the prime reasons for a fire suppression strategy.
5.5. Understand the various systems for fire detection, warning and fire suppression; including water, water-mist & gaseous suppressants.
5.6. Understand the elements of a security plan.
5.7. Understand the difference between physical security and electronic security.
5.8. Be aware of surveillance policy and procedures along with associated regulations and standards.

REFERENCES:

1. James Hannan, A Practical Guide to Data Centre Operations Management, Aurabach Publications.
2. Hwaiyu Geng, Data Centre Handbook, Wiley.

DIGITAL FORENSICS (MTCS046)

UNIT-I:

Introduction – Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential- Device handling: seizure issues, device identification, networked devices and contamination. Overview of Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations)

UNIT-II:

Digital forensics examination principles: Previewing, imaging, continuity, hashing and evidence locations- Seven element security model- developmental model of digital systems- audit and logs- Evidence interpretation: Data content and context.

UNIT-III:

Live Data collection and investigating windows environment: windows Registry analysis, Gathering Tools to create a response toolkit (Built in tools like netstat, cmd.exe, nbtstat, arp, md5sum, regdmp etc and tools available as freeware like Fport, Pslist etc), Obtaining volatile Data (tools like coffee, Helix can be used) Computer forensics in windows environment, Log analysis and event viewer, File auditing, identifying rogue machines, hidden files and unauthorized access points

UNIT-IV:

Live Data collection and investigating Unix/Linux environment: /Proc file system overview, Gathering Tools to create a response toolkit (Built in tools like losetup, Vnode, netstat, df, md5sum, strace etc and tools available as freeware like Encase, Carbonite etc). Handling Investigations in Unix/Linux Environment: Log Analysis (Network, host, user logging details), Recording incident time/date stamps, Identifying rogue processes, unauthorized access points, unauthorized user/group accounts,

UNIT-V:

Forensic Tools and Report Generation: Recovery of Deleted files in windows and Unix, Analyzing network traffic, sniffers, Ethical Hacking, Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscan etc. Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), Mobile forensic tools and analysis of called data record Template for computer forensic reports

REFERENCES:

1. Incident Response & Computer Forensics. Mandia, k, Prosise, c, Pepe, m. 2nd edition. Tata-McGraw Hill, 2003.
2. Guide to Computer Forensics and Investigations, 2nd edition, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning
3. Digital Evidence and Computer Crime, 2nd Edition , Eoghan Casey , academic Press File System Forensic Analysis by Brian Carrier , addition Wesley
4. Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, syngress Publication
5. EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition , Steve Bunting, sybex Publication

ELECTIVE-V

OPTIMIZATION TECHNIQUES (MTCS051)

UNIT-I:

Introduction: Introduction to OR Modeling Approach and Various Real Life Situations Linear Programming Problems (LPP) : Basic LPP and Applications ; Various Components of LP Problem Formulation Solving Linear Programming Problems : Solving LPP : Using Simultaneous Equations and Graphical Method ; Simplex Method ; Duality Theory ; Charnes' Big – M Method . Transportation Problems and Assignment Problems.

UNIT-II:

Network Analysis : Shortest Path : Dijkstra Algorithm ; Floyd Algorithm ; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded) .

UNIT-III:

Inventory Control : Introduction ; EOQ Models ; Deterministic and probabilistic Models ; Safety Stock ; Buffer Stock.

UNIT-IV:

Game Theory : Introduction ; 2- person Zero – sum Game; Saddle Point ; Mini-Max and 6L Maxi-Min Theorems (statement only); Games without saddle point ; Graphical Method ; Principle of Dominance.

UNIT-V:

Queuing Theory : Introduction ; Basic Definitions and Notations ; Axiomatic Derivation of the 7L Arrival & Departure (Poisson Queue). Pure Birth and Death Models; Poisson Queue Models : M/M/1 : ∞ /FIFO and M/M/1: N/ FIFO.

REFERENCES:

1. H.A. Taha, "Operations Research", Fifth Edn. Macmillan Publishing Company, 1992.
2. Hadley G., "Linear Programming" Narosa Publishers, 1987
3. Hillier F. & Liebermann G.J., "Introduction to Operations Research" 7/e (with CD), THM
4. Mustafi: Operations Research, New Age International

DIGITAL IMAGE PROCESSING (MTCS052)

UNIT-I:

Introduction: Fundamental steps of image processing, components of an image processing of system, the image model and image acquisition, sampling and quantization, station ship between pixels, distance functions, scanner

UNIT-II:

Statistical and spatial operations: Grey level transformations, histogram equalization, smoothing & sharpening-spatial filters, frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering. FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation.

UNIT-III:

Morphological and other area operations: basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images. Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds.

UNIT-IV:

Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding. Basics of color image processing, pseudocolor image processing, color transformation, color smoothing and sharpening, color segmentation, color image compression, compression standards

UNIT-V:

Image Transforms - Fourier, DFT, DCT, DST, Haar, Hotelling, Karhunen -Loeve, Walsh, Hadamard, Slant. Representation and Description - Chain codes, Polygonal approximation, Signatures Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, PCA.

REFERENCES:

1. Digital Image Processing – by Rafael.C.Gonzalez & Richard E.Woods, 3rd edition, Pearson Education, 2008.
2. Digital Image Processing, M.Anji Reddy, Y.Hari Shankar, BS Publications.
3. Fundamentals of Digital Image Processing – by A.K. Jain, PHI.
4. Digital Image Processing – William K, Part I - John Wiley edition.
5. Digital Image Processing using MATLAB – by Rafael.C.Gonzalez, Richard E.Woods, & Steven L.Eddins, Pearson Education, 2006
6. Digital Image Processing, Kenneth R. Castleman, Pearson Education, 2007.

PROFESSIONAL ASPECTS IN SOFTWARE ENGINEERING (MTCS053)

UNIT-I:

Intellectual Property rights

Confidential Information, Copyright, Infringement of Copyright, Acts permitted in Relation to Copyright Works, Licensing and Assignment of Copyright, Moral Rights, Designs, Trademarks, The tort of passing off, Domain Names, Patents.

UNIT-II:

Software Licenses

Copyright, Contract, Patent, Free Software and Open Source Software, MIT License, BSD License, GNU General Public License, GNU Lesser General Public License, Q Public License, Proprietary License, Sun Community License.

UNIT-III:

Software Contracts:

Basics of Software Contracts, Extent of liability, Contract for the supply of custom-built software at a fixed price, other types of software service Contract, Liability for defective software.

UNIT-IV:

Software Crime Prevention

Computing and criminal Activity, Reforms of Criminal Law, Categories of Misuse, Computer Fraud, Obtaining Unauthorized Access to Computer, Unauthorized Alteration or Destruction of Information, Denying Access to an Authorized user, Unauthorized Removal of Information Stored in a Computer.

UNIT-V:

Data Protection Regulations

Data Protection and Privacy, The impact of the Internet, Factors Influencing the Regulation of Data Processing, Convergence of Data Protection Practice, Defamation and the protection of Reputation.

REFERENCES:

1. Andrew M. St. Laurent, "Open Source and Free Software Licensing", O'Reilly Publications.
2. Frank Bott, et. al, "Professional Issues in Software Engineering", Taylor & Francis.

STORAGE AREA NETWORK (MTCS054)

UNIT–I:

Introduction to Storage Technology Information storage, evolution of storage technology and architecture, data center infrastructure, key challenges in Managing information, information lifecycle. Storage system Environments: components of storage system environment, Disk Drive components, Disk Drive Performance, fundamental laws governing disk performance, logical components of the host, application requirements and disk performance.

UNIT-II:

Data Protection: RAID: Implementation of RAID, RAID array components, RAID levels, RAID comparison, RAID Impact on disk performance, host spares. Intelligent Storage System: Components of an Intelligent Storage System, Intelligent Storage array, concepts in Practice: EMC CLARIION and Symmetric.

UNIT-III:

Direct – Attached Storage and Introduction to SCSI :Types of DAS, DAS benefits and limitations, disk drive interfaces, introduction to parallel SCSI, SCSI command model. Storage Area Networks: fibre channel, The SAN and Its evolution, components of SAN, FC connectivity, Fibre channel ports, fibre channel architecture, zoning, fiber channel login types, concepts in practice: EMC Connectrix.

UNIT–IV:

Network attached storage: general purpose servers vs NAS Devices, benefits of NAS, NAS file I/O, components of NAS, NAS Implementations, NAS file sharing protocols, NAS I/O operations, factors effecting NAS Performance and availability, concepts in practice: EMC Celerra.IP SAN: iscsi, fcip. Content – addressed storage: Fixed content and Archives, types of archives, features and benefits of CAS, CAS Architecture, object storage and retrieval in CAS, CAS Examples, concepts in practice: EMC Centera.

UNIT–V:
Storage Virtualization: Formats of Virtualization, SNIA Storage virtualization taxonomy, storage virtualization configurations, storage virtualization challenges, types of storage virtualization, concepts in practice: EMC Invista, Rainifinity. Introduction to business continuity: information availability, BC terminology, BC planning life cycle, Failure analysis, business impact analysis, BC technology solutions, concepts in practice: EMC Power path. Backup and recovery: backup purpose, backup considerations, backup granularity, recovery considerations, backup methods, backup process, backup and restore operations , backup topologies, backup in NAS environments, backup technologies, concepts in practice: EMC Networker, EMC Disk Library(EDL).

REFERENCES:

1. G. Somasundaram, A. Shrivastava, EMC Corporation: Information Storage and Management, 1st Edition, wiley publishing, 2009.
2. Robert Spalding, Storage Networks: The Complete Reference, 1st Edition,TMH, 2003.
3. Marc Farley: Building Storage Networks, 2nd Edition, Tata McGraw Hill, Osborne, 2001.
4. Meeta Gupta: Storage Area Network Fundamentals, 2nd Edition, Pearson Education Limited, 2002.

OPTICAL NETWORKS (MTCS055)

UNIT-I:
OPTICAL SYSTEM COMPONENTS: Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT-II:
OPTICAL NETWORK ARCHITECTURES : Introduction to Optical Networks; SONET / SDH, Metropoliton-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.

UNIT-III:
WAVELENGTH ROUTING NETWORKS: The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment,Virtual topology design, Wavelength Routing Testbeds, Architectural variations.

UNIT-IV:
PACKET SWITCHING AND ACCESS NETWORKS : Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT-V:
NETWORK DESIGN AND MANAGEMENT :Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network

management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

REFERENCES:

1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks: A Practical Perspective", Harcourt Asia Pte Ltd., Second Edition 2004.
2. C. Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks: Concept, Design and Algorithms", Prentice Hall of India, Ist Edition, 2002.
3. P.E. Green, Jr., "Fiber Optic Networks", Prentice Hall, NJ, 1993

ADVANCED DATA MODELING (MTCS056)

UNIT-I:

What is data modeling, The History of Data Modeling, Data Modeling Fundamentals, Entity Relationship Model, Enhanced Entity Relationship Models, UML, Physical Data Models.

UNIT-II:

Mathematical Foundation of the Relational Model, Keys and Referential Integrity, Functional dependencies and normalization, Relational Algebra, Relational Mappings.

UNIT-III:

Object Oriented Databases – Introduction, Weakness of RDBMS, Object Oriented Concepts Storing Objects in Relational Databases, Next Generation Database Systems, Object Oriented Data models, OODBMS Perspect, Issues in OODBMS, Advantages and Disadvantages of OODBMS.

UNIT-IV:

Object Oriented Database Design, OODBMS Standards and Systems, Object Management Group, Object Database Standard ODMG, Object Relational DBMS, Comparison of ORDBMS and OODBMS.

UNIT-V:

XML Fundamentals, XML Schema and DTD document definitions, XSLT transformations and

programming, Parsing XML.

REFERENCES:

1. Ramez Elmasri & Shamkant B.Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2010.

2. Peter Rob and Corlos Coronel, "Database Systems – Design, Implementation and Management", Thompson Learning, Course Technology, 5th Edition, 2003.

3. Graeme Simsion & Graham Witt, "Data Modeling Essentials, Third Edition", Morgan Kaufmann
4. David Hunter, Jeff Rafter, Joe Fawcett, and Eric van der Vlist " Beginning XML Fourth Edition, Wrox Publications.
5. A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts ", Fifth Edition, McGraw-Hill

MTCC 101 Research Process and Methodology

Module 1: Introduction to Research and Problem Definition

Meaning, Objective and importance of research, Types of research, steps involved in research, defining research problem

Module 2: Research Design

Research design, Methods of research design, research process and steps involved, Literature Survey

Unit 3: Data Collection

Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerationsin research

Unit 4: Data Analysis and interpretation

Data analysis, Statistical techniques and choosing an appropriate statistical technique, Hypothesis, Hypothesis testing, Data processing software (e.g. SPSS etc.), statistical inference, Interpretation of results

Unit 5: Technical Writing and reporting of research

Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals,Intellectual property, Plagiarism

Text Books:

1. C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques , New Age International publishers, Third Edition.
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005
3. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
4. Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013.