

NIT SCHEME
COURSE OF STUDY AND SCHEME OF EXAMINATION OF B.TECH./B.ARCH./M.TECH/M.C.A.
NATIONAL INSTITUTE OF TECHNOLOGY OF RAIPUR

Branch:- **Master of Computer Applications (M.C.A.)**
Semester:- **Vth Sem.**

Course:- **P.G.**

S. No.	Board of Study	Subject Code	Subject Name	Period Per Week			Scheme of Examination			Total Marks	Credit [L+(T+P)/2]
				L	T	P	ESE	CT	TA		
1.	MASTER OF COMP. APP.	CA40511(CA)	Advance Programming in Java	4	1	0	100	20	20	140	5
2.	MASTER OF COMP. APP.	CA40512(CA)	Distributed Computer Systems	4	1	0	100	20	20	140	5
3.	MASTER OF COMP. APP.	CA40513(CA)	Mobile Computing	4	1	0	100	20	20	140	5
4.	MASTER OF COMP. APP.	Refer Elective- I	Elective – I	4	1	0	100	20	20	140	5
5.	MASTER OF COMP. APP.	Refer Elective- II	Elective – II	4	1	0	100	20	20	140	5
6.	MASTER OF COMP. APP.	CA40521(CA)	Java Programming Lab	0	0	6	75	-	50	125	3
7.	MASTER OF COMP. APP.	CA40522(CA)	Project Lab - II	0	0	6	75	-	50	125	3
8.	HUMANITIES & SOCIAL SCIENCES	HS40523(CA)	Interview Preparation, Presentation Lab	0	0	2	-	-	50	50	1
Total				20	5	14	650	100	250	1000	32

Note (1)- 1/2 of total strength of students subject to Minimum Strength of thirty students is required to offer an elective in the institute in a particular academic session.

Note (2) - Choice of elective course once made for an examination cannot be changed for future examination.

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Branch:- **Master of Computer Applications (M.C.A.)**
Semester:- **Vth Sem.**

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Elective –I

CA40531(CA) - Neural Network & Fuzzy Logic
CA40532(CA) - Network Programming
CA40533(CA) - Modeling & Simulation
CA40534(CA) - Enterprise Resource Planning
CA40535(CA) - Management Information Systems
CA40536(CA) - Parallel Processing

Elective -II

CA40541(CA) - Data Warehousing and Mining
CA40542(CA) - Cryptography & Network security
CA40543(CA) - Analysis and Design of Algorithm
CA40544(CA) - Software Project Management
CA40545(CA) - Digital Image Processing
CA40546(CA) - Research Methodology and Computer Applications

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40511(CA)

ADVANCE PROGRAMMING IN JAVA

Unit 1: Overview of Java: Features of Java, Byte-code & JVM, data-types, Variables & Arrays, Control-statements, Introduction to Java class & object, main () function, garbage collection & finalize () method, this, Inheritance, method overriding, Dynamic method dispatching, super, final, package, Interface, Abstract class, Class path, String Class.

Unit 2: Exception and Multithreads: Exception-type, Uncaught Exception, Using trycatch, throw, throws, finally, Throwable class and object, Exception classes, Create own exception subclass. Creating multiple threads, isAlive(), join(), Thread priorities, synchronization, - Deadlock, wait(), notify(), notify All() methods, Inter-Thread Communication, suspend, resume & stop the threads.

Unit 3 : Stream and Socket : I/O classes & Interfaces, File, The Stream Classes, The Byte stream (InputStream, OutputStream, FileInputStream, File Output Stream), Serialization, Network basics, Networking classes and Interfaces, InetAddress, TCP/IP Client/Server socket, URL, URL Connection, Datagram , RMI.

Unit 4 : Event handling & working with windows : Delegation event model, event classes, Event listener interface, AWT Classes, Window fundamental, AWT Controls, Layout managers, Menus, Swings:- benefits of swing over AWT , Frames panels and borders ,labels and buttons , tabbed panes , scrolling panes, split panes , combo boxes , list boxes , text component, menu, toolbar and actions , progress bars, sliders and scrollbars , dialogs.

Unit 5 : Web development ; The Applet class, Applet Architecture, Applet skeleton, HTML APPLET Tag, Passing parameter to Applet, get Document Base (), get Code Base (), Applet Context, show Document(). A simple servlet, Javax. servlet package, Reading servlet parameter, web/application server, javax.servlet.http package, using cookies, session tracking.

Text Books:

- (1) *Herbert Schildt (2006), "The Complete Reference Java 2 (Updated to Cover J2SE 1.4)", Ed. 05, Tata McGraw-Hill publishing company Ltd. New Delhi, India.*
- (2) *Cay S. Horstmann Gary Cornell, " Core Java 2 Volume-I Fundamentals", Ed-07, PEARSON Education, Singapore Pte. Ltd., Indian Branch, New Delhi, India 2005.*

Reference books:

- (1) *Michael Morgan, "Java 2 for Professionals Developers", Ed. 01, SAMS, Techmedia, New Delhi, India 2000.*
- (2) *Bruce Echel, " Thinking in Java, The Definitive Introduction to Object-Oriented Programming in the Language of World-Wide-Web", Ed-03, PEARSON Education, Singapore Pte. Ltd., Indian Branch, New Delhi, India 2005.*
- (3) *Philip Heller and Simon Roberts, "Java 2 Developer's Hand Book", BPB Publication, New Delhi.*

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40512(CA)

DISTRIBUTED COMPUTER SYSTEM

UNIT – 1:

Introduction: Motivation, objectives, characterization & classification of distributed systems. Distributed system architecture. Hardware & software issues. Communication: Layered protocols, Client server protocols, RPC, group communication. Coordination, synchronization & consistency: Logical clocks, Physical clocks, mutual exclusion, election algorithms, atomic broadcast, sequential consistency transaction distributed consensus, Threads: Thread synchronization, implementation issues, and threads vs. RPC

UNIT – 2:

Models of distributed computing: Client server and RPC, RPC architecture, exceptions, underlying protocols, IDL, marshalling etc. Group models and peer to peer: Groups for service replication/reliability, groups for parallelism / performance, client/ server vs. peer-to-peer, multicast, atomic broadcast. Interprocess Communication: API for Internet protocols. External data representation and Marshalling. Client-Server communication and Group communication.

Distributed Objects and Remote Invocation- Communication between distributed objects, Remote procedure call, Events and notifications.

UNIT – 3:

Distributed file system: Security, Naming/ location transparency, R/W semantics, cache coherence, replication. Distributed shared memory: DSM architecture, consistency models and relation to caching, release consistency, comparison with message passing and RPC. Advanced Distributed Computing Paradigms: Message Queuing, Mobile agents, Network services, Object spaces

UNIT – 4:

Fault tolerant distributed systems: Introduction, dependability, faults vs. errors vs. failure, space time and value redundancy, fault tolerant architecture, failure detection algorithms, partitioning, FT consensus. Distributed multimedia system: Introduction, characteristics, and resource management stream adaptation

UNIT – 5:

Security: Introduction, security techniques, cryptographic algorithms, authentication and access control.

Case study: CORBA, RMI MACH

Text Books:-

1. Jean Dollimore, Tim Kindberg, George Coulouris, Distributed Systems: Concepts and Design, 4th Edition, Addison Wesley, 2005.
2. A. Taunenbaum, Distributed Systems: Principles and Paradigms
3. G. Coulouris, J. Dollimore, and T. Kindberg, Distributed Systems: Concepts and Design, Pearson Education

References:

- 1) Distributed systems, concepts and design, 3rd Edition, Addison Wesley by George Colouris, Jean Dollimore and Tim Kinder berg.
- 2) Distributed system, 2nd Edition, Addison Wesley by Sape Mull ender.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40513(CA)

MOBILE COMPUTING

Unit 1 : Introduction to telecommunication systems

Introduction: Current Wireless Systems: Overview of Paging Systems, Cordless Phones, Cellular Telephone Systems, Satellite Communication, Wireless LANs, Blue tooth. Medium access control, Telecommunication Systems – SDMA, TDMA, CDMA, GSM

Satellite Systems - Basics, Routing Localization, Handover. Broadcast Systems Overview, Cyclic Repetition of Data, Digital Audio Broadcasting, Digital Video Broadcasting,

Unit 2 : Wireless Standards

Wireless LAN – IEEE 802.11 – Infrared vs Radio Transmission, Infrastructure Networks, Ad-hoc Networks, HIPERLAN, Bluetooth Wireless ATM – Working group, Services, Reference Model, Functions, Radio Access Layer, Handover, Location Management, Addressing Mobile Quality of Service, Access Point Control Protocol.

Unit 3 : Mobile Network Layer

Mobile IP Goals, Assumptions and Requirements, Entities, IP packet Delivery Agent Advertisement and Discovery, Registration. Tunneling and Encapsulation, Optimization Reverse Tunneling, IPv6, DHCP. Ad-hoc Networks - Characteristics, Performance Issues, Routing in mobile hosts.

Unit 4: Mobile Transport Layer & Wireless Application Protocol

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission / Timeout Freezing Selective Retransmission, Transaction oriented TCP. Architecture, Datagram Protocol, Transport Layer Security , Transaction Protocol, Session Protocol , Application Environment , Wireless Telephony.

Unit 5 : Application Issues

Dynamic DNS File System, Synchronization Protocol, Context aware applications, Security, Analysis of existing wireless network, GSM Systems Overview: Architecture, Location tracking, and call setup. Security, Data Services N/W Signaling, GSM mobility management, Operations, Administration and maintenance.

Text Books

1. J Schiller ,'Mobile Communication' , Addison Wesley, 2000
2. John Wiley,' Mobile Communication Design Fundamentals', 1993.

Reference Books

- 1 Wireless Communication and Networks, Pearson Education, 2003.
2. WAP-Wireless Application Protocol, Pearson Education, 2003

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40531(CA)

NEURAL NETWORK & FUZZY LOGIC

UNIT-1 Introduction to Artificial Neural Networks: Elementary Neurophysiology, Models of a Neuron, Neural Networks viewed as directed graphs, Feedback, from neurons to ANN, Artificial Intelligence and Neural Networks; Network Architectures, Singlelayered Feed forward Networks, Multi-layered Feedforward Networks, Recurrent Networks, Topologies.

UNIT-2 Learning and Training : Activation and Synaptic Dynamics, Hebbian, Memory based, Competitive, Error-Correction Learning, Credit Assignment Problem: Supervised and Unsupervised learning, Memory models, Stability and Convergence, Recall and Adaptation.

UNIT-3 A Survey of Neural Network Models : Single-layered Perceptron – least mean square algorithm, Multi-layered Perceptrons – Back propagation Algorithm, XOR – Problem, The generalized Delta rule, BPN Applications, Adalines and Madalines – Algorithm and applications.

UNIT-4 Applications : Talking Network and Phonetic typewriter : Speech Generation and Speech recognition, Neocognitron - Character Recognition and Handwritten Digit recognition, Pattern Recognition Applications.

UNIT-5 Neural Fuzzy Systems : Introduction to Fuzzy sets, operations, relations, Examples of Fuzzy logic, Defuzzification, Fuzzy Associative memories, Fuzziness in neural networks and examples.

Text Books:

1. Artificial Neural Networks by B. Yagna Narayan, PHI
2. Neural Network Design by Hagan Demuth Deale Vikas Publication House.

Reference Books:

1. Neural Networks by James A. Freeman and David M. Strapetus, Pearson Education.
2. Neural Network & Fuzzy System by Bart Kosko, PHI.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40532(CA)

NETWORK PROGRAMMING

UNIT-1 Communication protocols, internet protocols, system network architecture, UUCP, XNS, IPX/SPX for LANs, protocol comparisons, TCP & IP headers, IPv4 & v6 address structures.

UNIT-2 Berkeley Sockets: Overview, socket address structures, value result arguments, byte ordering, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved)

UNIT-3 Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols, passing the descriptors

IPC: - PIPES, FIFOS, STREAMS & MESSAGES, Semaphore, Shared Memory.

UNIT-4 Winsock Programming: windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, DLL & new API's, DLL issues

UNIT-5 Programming Applications: Time & date routines: Internet Time & Date Client, Network Time Synchronization, Trivial file transfer protocol: Data Formats UDP Implementation, TCP Implementation, Remote login, Ping.

Text Books:

1. Window Socket Programming by Bobb Quinn and Dave Schutes
2. Steven.W.R: UNIX Network Programming, PHI (VOL I& II)

Reference Books:

1. Davis.R.: Windows Network Programming, Addison Wesley
2. NETWORK PROGRAMMING With Windows Socket By Baner .P., PH New Jersey

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40533(CA)

MODELING & SIMULATION

UNIT-1 System Models: Concept of a system, system environment, stochastic activities, continuous discrete system modeling, system modeling, type of models, static and dynamic systems, principles used in modeling, system studies.

UNIT-2 System Simulation: Techniques of simulation, monte carlo method, comparison of simulation and analytical methods, numerical computation techniques for continuous and discrete models, distributed leg models, cobweb models, simulation study.

UNIT-3 Continuous system simulation: Continuous system models, differential equation, analog computer, analog methods, digital analog simulation, CSSLS, CSMPIII Language. System dynamics: Historical background exponential, Growth and decay models, modified exponential growth models, logistic curves and generalization of growth models, system dynamics diagrams, dynamo language.

UNIT –4 Discrete system simulation: Discrete events, representation of time, generation of arrival patterns, simulation of telephone system, delayed calls, simulation programming tasks, gathering statistics, and discrete simulation language.

UNIT-5 Simulation Language: Classification of simulation languages, Introduction to GPSC, general description, action times, choice of paths, simulation of a manufacturing shop, facilities and storage, program control statements, priorities and parameters, numerical attributes, functions, simulation of a supermarket transfer models, GPSS model applied to any application, simulation programming techniques like entry types.

Text Books:

- 1 W.A. Spriet – Computer Oriented Modeling and Simulation
- 2 G. Gordan-Systems Simulations, PHI, 1995

Reference Books: -

- 1 T.A. Payer – Introduction to Simulation
- 2 Barnes – Modeling and Performance Measurement of computer systems.
- 3 V. Rajaraman “ Analog Simulation” PHI
- 4 Banks & Carson

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40534(CA)

ENTERPRISE RESOURCE PLANNING

UNIT-1: Conceptual foundation of Business Process reengineering: Role of information Technology and BPR; Process improvement and Process redesign, Process identification and mapping; Role/Activity diagrams, Process Visioning, and benchmarking.

UNIT 2: Enterprise Resource Planning: Evolution of ERP- MRP and MRP II, structure of ERP- two tier architecture, three tier architecture, Electronic data processing, management information system, Executive information system, ERP as an integrator of information needs at various Levels.

UNIT 3: Typical Business Processes: Core processes, Product control, Sales order processing, Purchases, Administrative processes, Human resource, Finance support processes, Marketing, Strategic planning, Research and development, Problems in traditional view.

UNIT 4: ERP models / functionality: Sales order processing, Production scheduling, forecasting, distribution, finance, features of each of the models, description of data flow across each module, overview of supporting databases.

UNIT 5: ERP implementation issues: Opportunities and problems in ERP selection, and implementation; ERP implementation: identifying ERP benefits, team formation, Consultant intervention, Selection of ERP, Process of ERP.

Text Books:

1. *ERP, Concepts and Practices, V.K. GARG & N .K. VENKATKRISHNAN;*, pm
2. *Enterprise wide Resource Planning-theory and practice, Rahul V. Altekar, PHI*

References:

1. *ALEXIS LEON: Enterprise Resource Planning, TMH*
2. *S. SADAGOPAN: MIS, pm*
3. *V. RAJARAMAN: Analysis and Design of Information Systems, PHI*
4. *MONK' & BRADY: Concepts in ERP, Vikas pub, Thomson*

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40535(CA)

MANAGEMENT INFORMATION SYSTEMS

UNIT 1: Introduction: Introduction to MIS, definition, Role, impact, subsystems of MIS, structure of MIS, MIS and computer, Executive information system, Transaction processing, Office Automation and information processing control functions.

UNIT 2: Conceptual Foundations: Decision making concept, method, tools, procedures, MIS and Decision making, Concept of information- mathematical definition, classification, methods of collection, value, age of information, Human as an information processor.

UNIT 3: Systems, Planning and Control: System concept – definition, General model of system, types, subsystems, preventing system entropy, system stress and system change, system concept applied to MIS. Concept of planning and control-concept of planning, planning process, computational support for planning, characteristics of control,

UNIT 4: DSS and Expert Systems: Concept and philosophy, characteristics, structure of decision making, classes of DSS, users of DSS, support for decision making process, AI systems, Knowledge based Expert systems, semantic networks, MIS and role of DSS

UNIT 5: Development and Implementation: Development of long range plans, ascertaining the class of information, determining the information requirement, Development and implementation of MIS, management of quality in MIS, organization for development of MIS, factors of success and failure of MIS

Text Book:

1. *Godon B. Davis & Margrethe H. Olson (2nd ed), "Management Information Systems", TMH*
2. *W.S. Jawadekar 'Management Information Systems' TMH*

References:

1. *S. Sadagopan 'Management Information Systems' PHI*
2. *Jerome Kanter (4th edition) 'Managing with Information' PHI*
3. *James A. Senn 'Analysis and Design of Information systems' MC Graw-Hill, International Edition*

PARALLEL PROCESSING

UNIT – 1:

Overview of modern processor architectures. Memory Hierarchy .Introduction to Parallel Processing: Flynn's classification, SIMD and MIMD operations, Shared Memory vs. message passing multiprocessors, Distributed shared memory, Hybrid multiprocessors, Overview of modern processor architectures. Memory Hierarchy, Cache and Cache Coherence Caches: associatively, allocation and replacement policies, sub-block placement. Multilevel caches, multilevel inclusion. Cache performance issues.

UNIT – 2:

Bus Architecture Implementations of shared memory: the cache coherency problem. Update vs. invalidation. The bus-based 'snooping' protocol design space. Scalable-shared memory using directory-based cache coherency. MESI protocol.

UNIT – 3:

Types of parallel machine: Vector Pipeline Architectures Pipelined CPU architecture. Instruction set design and pipeline structure, instruction Pipeline Design, Arithmetic pipeline design, Super scalar and Super pipeline design. Dynamic scheduling using score boarding and Tomasulo's algorithm. Software instruction scheduling and software pipelining. Super-scalar and long-instruction-word architectures. Branch prediction and speculative execution. Replicated Architectures: SIMD/MIMD. Shared Memory and Distributed Memory. RISC, CISC Scalar processors, super Scalar and VLIW Computers .Multi-vector Computers.

UNIT – 4:

Connectivity: Interconnection networks: topology, routing, flow control, deadlock avoidance, static and dynamic interconnection networks. Virtual channels, wormhole routing and vertical cut-through. Program and Network Properties, Conditions of parallelism , Program Partitioning and Scheduling , Program flow mechanisms , Principles of Scalable Performance , Performance Metrics and Measures , Parallel processing Applications , Speedup Performance laws.

UNIT – 5:

Parallel Algorithms: [a] Design Methodology and Analysis Techniques: Foster's Design Methodology, Time Complexity (computation and communication complexities), Speedup, Efficiency, Cost Optimality, Amdahl's Law, Brent's Scheduling Principle. [b]. Simple PRAM Algorithms: Boolean Operations, Max Finding in $O(1)$ time, Reduction, Prefix-Sum, etc. [c]. Basic Algorithms and Techniques: (i) Prime Numbers using Sieve Method; Monte Carlo Methods (e.g., Calculating Pi), (ii) Matrix Multiplication (Row and Column-based on a Ring Topology, and Block-based on a Mesh Topology - Cannon's algorithm), (iii) Sorting (Odd-Even transposition, Merge sort, Bitonic Merging and Sorting, Hyper Quicksort, Parallel Sorting with Random Sampling, etc.)

Text Books:

1. Kai hwang. "Advanced Computer Architecture", McGraw Hill International, 1993.
2. M .J. Quinn," Designing Efficient Algorithms for Parallel Computers", McGraw Hill International, 1994.

References:

1. Andrew S: Tanenbaum, Modern Operating Systems, 2nd Edition, Prentice Hall, 2001.
2. John Hennessy and David Patterson, Computer organization and Design: The hardware/Software interface, 2nd Edition, Morgan Kaufman Publishers.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40541(CA)

DATA WAREHOUSING AND DATA MINING

UNIT 1: Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology From Data Warehousing to Data Mining.

UNIT 2: Data Preprocessing & Data Mining Primitives, Languages, and System Architectures: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage. Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems.

Concepts Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.

UNIT 3: Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

UNIT4: Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT5: Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

Text Books:

1. *Data Mining – Concepts and Techniques* - JIAWEI HAN & MICHELINE KAMBER Harcourt India.
2. *Data Mining Techniques* – ARUN K PUJARI, University Press
- 3 *Building the Data Warehouse-* W. H. Inmon, Wiley Dreamtech India Pvt. Ltd..

Reference Books:

1. *Data Warehousing in the Real World* – SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.
2. *Data Warehousing Fundamentals* – PAULRAJ PONNAIAH WILEY STUDENT EDITION
3. *The Data Warehouse Life cycle Tool kit* – RALPH KIMBALL WILEY STUDENT EDITION
4. *Data Mining Introductory and advanced topics* –MARGARET H DUNHAM, PEARSON EDUCATION

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40542(CA)

CRYPTOGRAPHY & NETWORK SECURITY

UNIT 1: Foundation of Cryptography and Security:-The OSI Security Architecture , A model for network Security ,Symmetric cipher model Substitution techniques Mathematical Tools for Cryptography: Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic. Design Principle of Block ciphers: Theory of Block Cipher Design, Feistel ciphers. Cipher Network Structures, DES and Triple DES, Strength Of DES, Modes of Operation (ECB, CBC, OFB, CFB),.

UNIT 2: Block Cipher Algorithms:-IDEA, CAST, Blowfish, Two fish, AES, Pseudo Random Numbers and stream ciphers: pseudo random sequences, Linear Congruencies Generators, Cryptographic Generators, Design of Stream Cipher, RC4, RC5.

UNIT 3: Public Key Cryptography:- Prime Numbers and Testing for Primality, Factoring Large Numbers, Discrete Logarithms Principles of public key Cryptosystems RSA, Key Management Diffie-Hellman, key exchange, Introduction of Elliptic curve arithmetic, Key Exchange Algorithms, Public – Key Cryptography Standards. Hashes and Message Digests: Message Authentication codes, MD5, SHA-1, RIPEMD, HMAC.

UNIT 4: Digital Signatures, Certificates, and Standards:- Digital Signature Standard (DSS and DSA), **Public key Infrastructure, Digital Certificates** and Basics of PKCS Standards. Authentication: Kerberos V 4 and V 5, X.509 Authentication service. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, X.400. IP and Web Security Protocols: IPsec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS).

UNIT 5: System Security: Computer Virus, Firewall and Design Principles,;. Electronic Commerce Security: Electronic Payment Systems, Secure Electronic Transaction (SET), Protocols (CyberCash, iKey) Ecash (DigiCash), Smart Card Based Systems.

Text Books

(1) *Cryptography and Network Security, William Stallings, PHI.*

(2) *Applied Cryptography: Protocols & Algorithms, Schneier & Bruce, MGH International.*

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40543(CA)

ANALYSIS AND DESIGN OF ALGORITHM

UNIT-1 Introduction & Analysis: Analyzing algorithms, Growth function : Asymptotic notation, Standard notation & common functions, Recurrence relation heaps and introduction to 2-3 trees, Algorithms for manipulating 2-3 trees, Representation of heaps using 2-3 trees, Heap sort , Amortized Analysis.

UNIT-2 Dynamic Programming Paradigm: The basic dynamic programming paradigm, Viewing shortest path algorithms from that perspective, Dynamic programming solution to the optimal matrix chain multiplication and the longest common subsequence problems, Top down recursive algorithms using tables of solutions of sub problems as an alternative to bottom up general dynamic programming. Greedy Paradigm :The basic greedy strategy & computing minimum spanning trees, Algorithms of Kruskal and Prim, Use of Union Find Algorithm in implementation of Kruskal's algorithms, The relationship in Dijkstra's and Prim's algorithms, Use of greedy strategy in algorithms for the Knapsack problem and Huffman trees.

UNIT-3 Divide and Conquer Paradigm: Divide and Conquer recurrence equations and their solutions, Quick and merge sorting techniques from the perspective of their fitting into the divide and conquer paradigm, Linear time selection algorithm, The basic divide and conquer algorithm for matrix multiplication. Basic Graph Algorithms: Representational issues in graphs, Depth first search on graphs, Computation of biconnected components and strongly connected components using the depth first-search paradigm, Topological sorting of nodes of an acyclic graph. Shortest Path Algorithms on Graphs: Bellman- Ford shortest path problem, Dijkstra's algorithm & Analysis of Dijkstra's algorithm using Fibonacci heaps, Floyd-Warshall's all pairs shortest path algorithm and its refinement for computing the transitive closure of a graph.

UNIT-4 String Matching Algorithms: Modelling the general string problem as a finite automata, Motivation of the failure function in the Knuth Morris and Pratt Paradigm, Linear time analysis of the KMP algorithm, The Boyer-Moore refinement of the KMP algorithm, computation of the failure functions for the Boyer-Moore algorithm.

UNIT-5 NP-Complete Problems: Examples of problems like traveling salesman tour for which enumeration and back tracking seems to be the only method of finding the optimal solution, The notion of a non deterministic algorithm and its basic relationship to back tracking. The notion of a polynomial time nondeterministic algorithm, Polynomial time non deterministic algorithms for problems like satisfiability, clique problem, Hamiltonian path problems etc. , The definition of Np-hardness and Np-completeness, The statement of Cook's theorem and a discussion of its implications, The notion of polynomial transformation and reductions, Reductions to show that the clique problem, vertex cover, subset sum and Hamiltonian cycle problems are NP-complete.

Text Books:

1. Introduction to Algorithms (Second Edition) PHI, Corman, Lelerson, Rivert and Stein
2. Fundamentals of Algorithms, Galgotia, Sahni & Horowitz.
3. Analysis of Algorithms, Pearson Education, Hoffcroff.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40544(CA)

SOFTWARE PROJECT MANAGEMENT

UNIT 1: Introduction to project Management: Working of a traditional organization, characteristics of a PROJECT, their aspects, management functions and their viewpoints, Project management and its functional nature, Roots of PM, its goals, Type of project managers, job functions of project manager.

UNIT 2: Project Management Process: Project processes, its dimensions, project boundaries, Grouping of PM processes. Project management interactions, Project scope managements and its process flow, Project time managements and its process flow, Project cost managements and its process flow, Project quality managements and its process flow, RISK management process and its process flow, HR management process and its process flow, Project communication management and process flow

UNIT 3: Pre-Project Scenario: Service-level agreement, its key concepts, its benefits, feasibility study, feasibility and requirements, need for engineering economics analysis, types of costs and benefits, need of project estimation & problems. Productivity, Decompositioning and estimation, Resource considerations after system study.

Project Initiation: Purpose, activities of Project initiation, Project charter, is address & others. Enterprise environmental factors. **Project Planning:** Project management plan, contents of project plan, process work breakdown structure (WBS). Activity resource estimating process. HR planning, staff management plan, Quality planning, Communication planning, Risk Management planning, Procurement management plans.

UNIT 4: Project Execution: Project plan execution, its responsibilities, process Group, execution, need of quality assurance, quality audits, type of audits,

Project Team: Resource leveling, negotiations, using external resources, team in PM & their troubles, effective project teams, Training & Development, Recognition & Rewards, performance improvement, advertising, conferences, proposal, contracts & its types, Information distribution, communication skills.

UNIT 5: Project Monitoring & Control: Project control, relationship between planning and control, role of monitoring in PC, project control process, monitoring project work, schedule control process, cost control process, quality control process, Managing project teams, reporting and reviews, types of project evaluation, Project actioning, Risk monitoring & control, contract administration.

Project closing & Beyond: closing process group, project process, close project contract closeout, project success, project failure, Implementation process, Training for implementation.

Text Books:

1. *Information Technology Project Management, S.A. Kelkar, PHI*
2. *The art of project management, Berkun, Shroff publishers*

References: *Quantitative methods in project management, Shroff publishers*

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - Vth Semester MCA Code : CA40545(CA)

DIGITAL IMAGE PROCESSING

UNIT 1

INTRODUCTION & FUNDAMENTALS

Origin of DIP, examples of fields that use DIP, fundamentals of DIP, components of an DIP system, Image formation model, Spatial & Gray level resolution, Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters- smoothing and sharpening, Laplacian filter, Canny edge detector., image sampling and quantization, some basic relationships between pixels.

UNIT 2

IMAGE ENHANCEMENT AND SEGMENTATION

Image Enhancement in Spatial Domain:Background, some basic gray level transformations, Histogram processing, enhancement using arithmetic and logic operations, basic of spatial filtering, smoothing spatial filters, sharpening spatial filters.

Image Enhancement in the Frequency Domain :Background, Introduction to FT and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, additional properties of the 2-D FT, convolution, line detection, Edge Detection, Edge Linking and boundary detection, Global Thresholding, Ostu's method, multiple threshold, variable threshold, multivariant threshold, Region based Segmentation., Corner Detection, segmentation using Morphological watersheds.

UNIT 3:

IMAGE COMPRESSION

Fundamentals, image compression models, elements of information theory, error free Compression, run length coding, Huffman coding, LZW coding, Arithmetic coding, LZW coding, symbol based coding, bit plane coding, predictive coding, wavelet coding, loss less predictive coding, lossy predictive coding, image compression standards, DCT, JPEG, MPEG video compression standards, watermarking.

UNIT 4

MORPHOLOGICAL IMAGE PROCESSING

Erosion, dilation, opening, closing, Basic Morphological Algorithms: hole filling, connected components, thinning, skeletons, some basic morphological algorithms, Gray scale Morphology.

UNIT 5

IMAGE REPRESENTATION, DESCRIPTION & RECOGNITION

Representation, Boundary descriptors, Regional descriptors, Principal component analysis, Recognition based on decision theoretic & structural methods. Optimum statistical classifiers, neural network, string matching, matching shape numbers. Small project work for DIP.

Books :

1. **Digital Image Processing** by Rafael .C .Gonzalez and Richard. E.
2. **Digital Image Processing** – by William K. Pratt 3rd Edition John Wiley and Sons Inc.
3. P. Suetens, *Fundamentals of image processing*, Cambridge University Press, 2002.
4. R. C. Gonzalez, R. E. Woods, S. L. Eddins , *Digital Image Processing Using MATLAB(R) ,Course Technology*, 1 edition, 2004
5. A. K Jain, *Fundamentals of image processing*, prentice hall, Eagle cliffs, New Jersey, 1989
6. Chanda & Majumdar, *Digital image processing and analysis*, PHI, 2003

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RESEARCH METHODOLOGY AND COMPUTER APPLICATIONS

UNIT – 1: Research: Types, Research process and steps in it, Hypothesis, Research proposals and aspects.

Research Design: Need, Problem Definition, variables, research design concepts,

Literature survey and review, Research design process, Errors in research.

Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Heuristic and Simulation modeling.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals.

UNIT – 2:

Design of Experiments: Objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles-replication, randomization, blocking, Guidelines for design of experiments.

Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, Model adequacy checking.

UNIT – 3:

: Two factor Factorial Design, Basic definitions and principles, main effect and interaction, response surface and contour plots, General arrangement for a two-factor factorial design; Models-Effects, means and regression, Hypothesis testing.

UNIT – 4: Computer Applications : Spreadsheet Tool: Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/graph and other features. Tools used may be Microsoft Excel, Open office or similar tool. Presentation Tool: Introduction to presentation tool, features and functions, Creating presentation, Customizing presentation, showing presentation. Tools used may be Microsoft Power Point, Open Office or similar tool.

UNIT – 5:

Web Search: Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo etc, Using advanced search techniques.

References:

1. Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, (Wiley India)
2. Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley India)
3. Kothari C.K. (2004), 2/e, Research Methodology- Methods and Techniques (New Age International, New Delhi)
4. Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjani M. (2006), Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
5. The complete reference Office Xp – Stephan L. Nelson, Gajula Kelly (TMH)
6. Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH)

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JAVA PROGRAMMING LAB

Experiments to be performed:

- (i) Write a program to create a class called **PassObjectDemo** with two variables **a** and **b** of type integer and method with following prototype-
Pass Object Demo get Parameter To Sum (Pass Object Demo p, Pass Object Demo q)
Which will accept two parameter of object of same class two add the individual member variable **a** and **b** of both the objects and returns the same class object in the called area. Store this returned object in the called area and display the value of variables of this object by using **void getDisplay()** method.
[Passing object as a parameters and returning object]
- (ii) Create two classes called **A** and **B**. the class has two variables a, b and two function **void getData()**, **void getSum()**. Similarly class B has two variable c, d and two method **void getData()**, **void getSum()**. Now pass reference of class A into B, and reference of class B into class A to access members.
[Note: Program for two way communication within the classes]
- (iii) Write a program to create two classes called **A** and **B**. Class A has two variable 'a' and 'b' with two methods **void getData()** used to get values of 'a' and 'b' and **void getDisplay()** used to display the sum of relevant variables. Similarly class **B** has two variables 'c' and 'd' of type integer with two function **void getData()** used to get values of 'c' and 'd' and **void getDiv()** used to divide corresponding variables. Extend **A** by **B** and call methods of **B** in the class **A** by **dynamically**. Use **super()** to call constructor of B if require.
[Use of super]
- (iv) Write a program to generate own exception class called **MyException** used to generate exception during **execution**. Create **ExceptionDemo** class; inside this define one method named **void getAge (int a)** which will **throws MyException** if negative age is entered. Create another class **UsingMyException** used to call this method with an integer parameter for age.
- (v) Write a program to define a method called **void call ()** in class **CallMe**. Create another class **Caller** which implements **Runnable** interface, to create multiple threads. These threads will call **void call ()** method of **CallMe** class synchronously by using **synchronized block or synchronized statement**. Create another class **Synch** in which main () method will start execution of these threads as chilled threads.
[Synchronization]
- (vi) Write a program to demonstrate **Inter-thread communication** for two threads consider thread 1 generating one integer number & thread 2 accepting it via two method **wait ()** and **notify ()**.
- (vii) Write a program to create I / O stream to read and write content of disc file.
- (viii) Write a program to create Client/Server socket to establish communication in bi-directional.
- (ix) Write a program to create URL connection to current find out status of a web site.

- (x) Write a program to show all the AWT Components of the Java.
- (xi) Write a program to show all the Swing Components of the Java.
- (xii) Write a program to demonstrate Swing/AWT components with its corresponding event and listener interfaces, event registration, and called relevant event methods.
- (xiii) Create an Applet for accepting parameters through **getParameter()** method of Applet class which is coming from **param** tag of relevant **HTML** file and display the gathered parameter through **public void paint(Graphics g) method** in the Applet. Also find out the location of applet & path by using **getDocumentBase()**, **getCodeBase()** methods of **Applet** class. And also use Applet Context interface and showDocument() method to context another applet.
- (xiv) Write a program to create simple servlet and deploy by using tomcat server.
- (xv) Write a program to implement session tracking and cookies in the servlet.

List of Equipments/Machine required :

- (i) Software: The Java Development Kit version 1.3 (JDK 1.3 or more) and Java Servlets Development Kit.
- (ii) Operating System: Win32 Release for Windows 98 and Windows NT on Intel hardware. For Windows NT, only version 4.0 is supported.
- (iii) RAM / Processor: A 486/DX or faster processor and at least 64 megabytes of RAM are recommended.

Recommended Books:

- (i) *“Head First Java” by Kathy Sierra & Bert Bates O’Reilly Publication.*
- (ii) *“Head First Servlets and JSP “ Bryan Basham , Kathy Sierra & Bert Bates.*

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PROJECT LAB - II

1. Out of 40 periods allocated, in 10 periods of Introduction to ASP / JSP, connectivity to database must be taught.
2. Students are supposed to make a web based project