

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

SYLLABUS FOR MCA PROGRAMME

1.0 Objectives of the MCA course

The M.C.A. program prepares students to take up positions as systems analysts, systems designers, programmers, and managers in any field related to information technology. The program, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice. The M.C.A. students are encouraged to spend a full semester working in the industry/ in the institute giving them insight into the workings of the IT world. However, the course curriculum will have enough flexibility to enable a student to undertake advance studies in Computer Science later on.

2.0 Course Outline Semester Wise

Semester-I

Subject Code	Subject	Contact Hrs.	Credit
MCC101	Programming in C	3-1-0	4
MCC102	Micro-processors and Assembly Language Programming	3-1-0	4
MCC103	Discrete Mathematics	3-1-0	4
MCC104	Engineering Economics and Costing	3-0-0	3
MCC105	Financial Accounting	3-0-0	3
MCC106	Communicative English	2-0-0	2
MCL107	Communicative English Lab-I	0-0-3	2
MCL108	Lab – I (C Programming Lab)	0-0-6	4
MCL109	Lab – II (Assembly Language Programming Lab)	0-0-3	2
Total			28

Semester-II

MCC201	Data Structures Using C	3-0-0	3
MCC202	Computer Organization and System architecture	3-1-0	4
MCC203	Object orientated Programming using C++	3-0-0	3
MCC204	Theory of Computation	3-0-0	3
MCC205	Computer Based Numerical Methods	3-0-0	3
MCC206	Business Communication in English	2-0-0	2
MCL207	Communicative Practice Lab-II	0-0-3	2
MCL208	Lab – III (Data Structure in C Lab)	0-0-6	4
MCL209	Lab – IV (C++ Programming Lab.)	0-0-3	2
MCS210	Seminar	0-0-3	2
Total			28

Semester-III

MCC301	Analysis and Design of Algorithms	3-1-0	4
MCC302	Operating Systems	3-1-0	4
MCC303	Computer Networks	3-0-0	3
MCC304	Data Base Systems	3-1-0	4
MCC305	Probability and Statistics	3-0-0	3
MCC306	Management Information System	3-0-0	3
MCL307	Lab – V (Operating System & Network Lab.)	0-0-6	4
MCL308	Lab – VI (Data base Lab)	0-0-3	2
MCL309	Communication and Interpersonal Skills for Corporate Readiness	0-0-2	1
Total			28

Semester – IV

MCC401	Programming with Java	3-1-0	4
MCC402	Computer Graphics & Multimedia	3-0-0	3
MCC403	Software Engineering	3-0-0	3
MCC404	Compiler Design	3-1-0	4
MCC405	Quantitative Techniques-I (Operations Research)	3-0-0	3
MCC406	E-Commerce & ERP	3-0-0	3
MCL407	Lab – VII (Programming with Java Lab.)	0-0-6	4
MCL408	Lab – VIII (Comp. Graphics & Multimedia Lab.)	0-0-3	2
MCS409	Seminar	0-0-3	2
Total		28	

Semester – V

MCC501	Artificial Intelligence and Expert system	3-1-0	4
MCC502	Object Oriented Analysis and Design with UML	3-0-0	3
MCC503	Internet Technology and enterprise Java	3-1-0	4
MCC504	Quantitative Techniques-II (Modeling & Simulation)	3-0-0	3
Elective-I		3-0-0	3
Elective-II		3-0-0	3
Elective-I			
MCE505	Distributed Systems		
MCE506	Parallel Computing		
MCE507	Image Processing		
MCE508	Web Engineering		
Elective-II			
MCE509	Computer Security		
MCE510	Software Design		
MCE511	Bioinformatics		
MCE512	Soft Computing		
MCL513	Assignment *	0-0-3	2
MCL514	Lab – X (Enterprise Web Computing Java Lab.)	0-0-6	4
MCV515	Comprehensive Viva-voce		4
Total		30	

Semester –VI

MCP601	Project work for 16 weeks**	20
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* There will be atleast 10 weekly assignments to be submitted by students on the subject

“object oriented Analysis and design with UML”. Weekly evaluation will be done by a group of teachers of the department of 10 marks each taking personal viva of the students for a total of 100 marks.

** There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert and teachers of the department.

3RD SEMESTER

MCC 301 ANALYSIS AND DESIGN OF ALGORITHMS

Module-I (13 hours)

Introduction to analysis and design of algorithm, Growth of functions, Asymptotic notations, Recurrences, Solution of recurrences by substitution, Recurrence tree and the master method. Divide and conquer algorithms (Worst case analysis of merge sort, quick sort and heap sort algorithms), Priority queue, Data structure for disjoint sets (Disjoint set operations, linked list representation, disjoint set forests)

Module-II (13 hours)

Dynamic programming approach: Matrix chain multiplication, longest common subsequence. Greedy method: Activity solution problem, Greedy verses dynamic programming, Huffman codes. Concept of backtracking, branch & bound design techniques. Graph algorithms: Minimal spanning tree (Kruskal and Prim's algorithms), Single source shortest paths (Bellman-Ford and Dijkstra's algorithm), Floyd's algorithm.

Module –III (14 hours)

Flow Network, Ford-Fulkerson method, Fast Fourier Transform, Rabin-Karp string matching algorithm. NP-Completeness, Polynomial time solvability, Verification and Reducibility, NP complete problems (without proof), Approximation algorithm for the traveling salesman problem.

Text book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and L. Stein, "Introduction to Algorithms", Second Edition, PHI Learning, 2002

Chapters: 1, 2, 3, 4(excluding 4.4), 6, 7 (7.4.1), 15(15.2, 15.3, 15.4), 16(16.1, 16.2, 16.3), 21(21.1, 21.2, 21.3) 23, 24(24.1, 24.2, 24.3), 26(26.1, 26.2), 30(30.1, 30.2), 32(32.1, 32.2), 34, 35(35.2)

Reference books:

1. E. Horowitz, S. Sahani, S. Rajsekharan, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2007

2. J. Kleinbers, E.Tardos, Algorithm design, Pearson Education Inc., New Delhi , 2006

3. R. Johnsonbaugh, M. Schaefer, "Algorithms", Pearson Education Inc., New Delhi , 2004

4. Kenneth A. **Berman** & Jerome L. **Paul**, "Algorithms", Revised Edition, 2005, CENGAGE Learning India Pvt. Ltd., New Delhi.

5. Anany V. **Levitin**, "Introduction to the Design and Analysis of Algorithms", Second Edition, 2007, Pearson Education Inc., New Delhi.

6. Michael T. **Goodrich** and Roberto **Tamassia**, "Algorithm Design: Foundations, Analysis, and Internet Examples", 2nd Edition, Wiley India Pvt. Ltd., New Delhi

MCC 302: OPERATING SYSTEMS

Module-1 (16 hours)

Introduction — Evolution of Operating Systems, Types of operating systems, Operating System Structures, Hardware and software structures needed for an operating system.

Process Management: Processes—States & Life cycle of process, Schedulers, Context Switching, Process scheduling policies—Preemptive vs. Non-preemptive, CPU scheduling algorithms, Threads—States & Life cycle of thread, thread scheduling, Types of threads & Examples. Inter-process Communication (IPC) Mechanisms—Concurrent processes, Process synchronization, Critical Section, Peterson's Solution, Classic IPC Problems, Semaphores, Concurrent programming, Monitors.

Module-2 (14hours)

Deadlock—Basic cause of deadlock, Conditions for deadlock, resource allocation graph, Wait for graph, Strategies for handling deadlocks, Starvation, Havender's linear ordering principle, deadlock avoidance & detection, Safe state, Dijkstra's Banker's Algorithm.

Memory Management: Main Memory, Static & Dynamic Partition schemes, multiple partitions schemes, Fragmentation, Compaction, Buddy Systems, Partition selection algorithms, de-allocation strategy, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory: Demand Paging, Copy-on-Write, Page Replacement Policies, Belady's Anomaly, Thrashing, Working set model.

Module-3 (10hrs)

Storage (File and Device) Management: File-System Interface, File-System Implementation, Mass-Storage Structure, Disk Scheduling, RAID Structure, I/O Systems.

Outline of : Multiprocessor Management, Protection & Security, Real-Time Operating Systems, and Multimedia Operating Systems, Case Studies: Windows XP/ Vista, Linux.

Text books:

1. Abraham **Silberschatz**, Peter Baer **Galvin**, Greg **Gagne**, "Operating System Concepts", Eighth Edition, 2009, Wiley India Pvt. Ltd., New Delhi.
Reading Chapters: 1-15 & 19-22 (excluding chapters: 16, 17, 18, and 23).
2. Harvey M. **Deitel**, Paul J. **Deitel**, David R. **Choffnes**, "Operating Systems", Third Edition, 2004, Pearson Education Inc., New Delhi.

Reference Books:

1. Andrew S. **Tanenbaum**, "Modern Operating Systems", Third Edition, 2008, PHI Learning Pvt. Ltd., / Pearson Education Inc., New Delhi.
2. Ramez **Elmasri**, A. G. **Carrick**, David **Levine**, "Operating Systems: A Spiral Approach", First Edition, 2009, McGraw-Hill Education (India), New Delhi.
3. Ann **McIver Hoes** and Ida M. **Flynn**, "Understanding Operating Systems", Fifth Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
4. Gary **Nutt**, "Operating Systems", 3rd Edition, 2004, Pearson Education Inc., New Delhi.
5. William **Stallings**, "Operating Systems: Internals and Design Principles", Sixth Edition, 2009, PHI Learning Pvt. Ltd., / Pearson Education Inc., New Delhi.

MCC 303: COMPUTER NETWORKS

Module-I (12 hours)

Introduction to Data Communications and Networking, Evolution of Computer Networks, General Principles of Network Design: Topologies, Network Models (ISO-OSI, TCP/IP), Network Architecture & Standardization (IEEE 802.x), Example Networks, Access Networks.

Physical Layer: Theoretical Basis for Data Communication-Data, Signals, Transmission (Digital vs Analog), Throughput, Bandwidth, Bit rate, Baud Rate, Data rate measurement-Nyquist formula & Shannon capacity, Multiplexing, Transmission Media (Guided Media, Unguided media: Wireless), Switching (Circuit, Message, Packet).

Module-II (16 hours)

Data Link Layer: Data Link Layer Design Issues, Error detection and Correction, Data Link Control, Elementary Data Link Protocols, Sliding Window Protocols, Protocol Verification, MAC Sub layer: Channel Allocation Problems, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband Wireless, Bluetooth, Data Link Layer Switching, Network devices: Repeater, Hubs, Bridges, Switches, Routers, Gateways, Backbone networks and Virtual LANs, Wireless WANs, Virtual Circuit Networks: Frame Relay and ATM

Network Layer: Network Layer Design Issues, Logical Addressing, Internet Protocol, Address Mapping, Error Reporting and Multicasting, Delivery, Forwarding, Routing Algorithms.

Module-III (12 hours)

Transport Layer: Transport Service, Elements of Transport Protocols, Process to Process Delivery—UDP, TCP, Congestion Control, Congestion Control Algorithms, Quality of Service.

Application Layer: DNS, Remote Logging, File transfer, SNMP, Multimedia, Ziff's law.

Security: Cryptography, Network Security, Kerberos, Internet Security: IPsec, SSL/TLS, PGP, VPN, Firewalls.

Text Books:

1. Behrouz A. **Forouzan**, "Introduction to Data Communications and Networking", Fourth Edition, 2007, McGraw-Hill Education (India), New Delhi.
2. Natalia **Olifer** & Victor **Olifer**, "Computer Networks: Principles, Technologies and Protocols", First Edition, 2006, Wiley India Pvt. Ltd., New Delhi.

Reference Books:

1. Andrew S. **Tanenbaum**, "Computer Networks", Fourth Edition, 2003, PHI Learning Pvt. Ltd., / Pearson Education Inc., New Delhi.
2. James F. **Kurose**, Keith W. **Ross**, "Computer Networking: A Top-Down Approach Featuring the Internet", 4th Edition (2008), Pearson Education Inc., New Delhi.
3. Wayne Tomasi, "Introduction to Data Communications and Networking", First Edition, 2005, Pearson Education Inc., New Delhi.
4. Prakash **Gupta**, "Data Communication and Computer Networks", 2008, PHI Learning Pvt. Ltd., New Delhi.
5. Curt **White**, "Data Communications and Networking", First Edition, 2008, CENGAGE Learning India Pvt. Ltd., New Delhi.
6. L. L. Peterson & B. S. Davie," Computer Networks", Fourth Edition, Elsevier Inc,

MCC 304: DATABASE SYSTEMS

Module 1

(10 hours)

Introduction: Data & Information, Evolution of Database Systems, Overview of a DBMS, Database System Concepts & Architecture - Data models, schemas and instances, Data Abstraction, Data Independence, Database languages and interfaces.

Database Characteristics: Data modeling using Entity - Relationship (ER) Model: Entity sets, attributes and keys, Relationship types, sets, roles and structural constraints, Weak Entity types. Data Models: Relational, Network, Hierarchical and Object Oriented.

The Relational model: Relational data model concepts, Codd's 12 rules, Relational model constraints and schemas, Relational Algebra and Relational calculus, Constraints on Relations, Relational database design by ER & EER to Relational Mapping, Database Language SQL & QBE. SQL Programming Techniques: Constraints and Triggers, Views and Indexes, SQL in Server Environment.

Module 2

(16 hours)

Database Design: Data dependency, Armstrong's Axioms, Functional dependencies and Normalization of Relational Databases, First, Second and Third Normal forms, Boyce-Codd Normal form (BCNF), Relational Database design Algorithms and further dependencies, De-normalization

Storage Strategies and file organizations: Disc Storage, Basic File Structures and Hashing, Indexing structures for files, multi-level indexing using B-trees and B⁺-trees.

Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Execution, Query Compiler, and Query Optimization Algorithms.

Module 3

(14 hrs)

Transaction processing concepts: Introduction to Transaction Processing concepts and Theory, ACID Properties, concurrency control, Serializability and Recoverability, Database recovery techniques - Shadow paging, ARIES recovery algorithm, Database Security. Deadlock: Detection, Avoidance and Recovery.

Outline of: Information Integration, Data Mining, Data Warehousing and OLAP, Database Systems and the Internet, Search Engines, Semi-structured Data Model, XML and Web Databases, Object & Object Relational Databases, Distributed Databases, Deductive Databases, Mobile Databases, Multimedia Databases, GIS.

Text Books:

1. Ramez **Elmasri** and Shamkant B. **Navathe**, "*Fundamentals of Database Systems*", Fifth Edition (2007), Pearson Education Inc., New Delhi.
2. Abraham **Silberschatz**, Henry F. **Korth** and S. **Sudarshan**, "*Database Systems Concepts*", Fifth Edition (2006), McGraw-Hill Education, New Delhi

Reference Books:

1. Hector **Garcia-Molina**, Jeffret D. **Ullman**, Jenniffer **Widom**, "*Database Systems: A Complete Book*", Second Edition, 2009, Pearson Education Inc., New Delhi.
2. Peter **Rob** & Carlos **Coronel**, "*Database Systems: Design, Implementation, and Management*", Eighth Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
3. Mark L. **Gillenson**, "*Fundamentals of Database Management Systems*", First Edition, 2005, Wiley India Pvt. Ltd., New delhi.
4. Nilesh **Shah**, "*Database Systems Using Oracle*", Second Edition, 2005, PHI Learning Pvt. Ltd., New Delhi.
5. **Raghu Ramakrishnan**, Johannes **Gehrke**, "*Database Management Systems*", Third Edition (2003), McGraw-Hill Education (India), New Delhi.

MCC: 305 PROBABILITY AND STATISTICS

Module 1 (13 hours)

Probability: Introduction, Probability of an event, additive rule & multiplication rule, conditional probability Bayes' rule, random variable, discrete and continuous probability distribution, Joint probability distribution, Mathematical expectation, Variance and co-variance of random variables, Mean and co-variance of linear combination of random variables, Chebyshev theorem, Binomial & Multinomial, Hypo-geometric, Geometric, Poisson distribution.

Module 2 (13 hours)

Uniform, Normal, Exponential Distribution, Weibull's Distribution, Chi-square distribution, Sampling Distribution: Sampling distribution of S^2 , t- distribution, F-distribution

Estimation of parameter: methods of estimation, Estimating the mean of a single sample, Standard error, Prediction interval, Tolerance limits, Estimating the difference between means of two samples, Estimating proportion and variance of a single sample, Estimating the difference between two proportions and variances of two samples, maximum likelihood estimation.

Module 3 (14 hours)

Test of hypothesis: one and two tailed test, test on a single mean when variance is known & variance is unknown. Test on two means, test on a single mean population and test on two populations. One and two sample test for variance. χ^2 test for goodness of fit and test for independence.

Introduction to linear regression: Simple regression models, Method of least square, Properties of least square estimators, Inferences concerning the regression coefficients, Coefficients of determination and its application.

Statistical quality control (Simple idea only)

Text Book:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers & Keying Ye, "Probability & Statistics for Engineers & Scientists", Eighth Edition, 2007, Pearson Education Inc., New Delhi.
2. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd

Reference Books:

1. William Mendenhall, Robert J. Beaver & Barbara M. Beaver, "Introduction to Probability and Statistics", 13th Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. Arnold Allen, "Probability Statistics and Queuing Theory with Computer Science Applications", Second Edition, 2005, Elsevier India Pvt. Ltd., New Delhi.
3. Levin and Rubin, "Statistics for Management", PHI
4. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw Hill
5. Ronald Deep, "Probability and Statistics", Academic Press

MCC: 306 MANAGEMENT INFORMATION SYSTEMS

Module-I (12 hours)

Fundamentals of Information Systems, Systems approach to problem solving, Developing information system solutions. Information system components, Information quality, Data resource management, Database, Data models, Information Systems in marketing, manufacturing, HRM, Accounting and Finance.

Module-II (12 hours)

Information analysis and design tools : Decision tools, Decision Table, Structured Analysis, Dataflow Analysis, Tools for dataflow strategy, Developing dataflow diagrams, Leveling, Data dictionary, Structured flow chart, HIPO, Warnier/ORR diagram

Module-III (12 hours)

Planning & implementation of Information Systems, Transaction Processing Systems, Executive information Systems, Decision Support Systems, Expert Systems, Knowledge Management. Computer crime, Security (Goals, risks, controls, security & recovery measures of IS, economics of information security) & ethical challenges.

Text Books:

1. James A. **O'Brien**, George M. **Marakas**, "Management Information Systems", Eighth Edition, 2008, McGraw-Hill Education (India), New Delhi.
2. Kenneth C. **Laudon**, Jane P. **Laudon**, "Management Information Systems", Tenth Edition, Pearson Education Inc., New Delhi.

Reference Books:

1. Kenneth E. Kendall, Julie E. Kendall "System Analysis and design", PHI Learning Pvt. Ltd., New Delhi.
2. James A. Senn "Analysis & Design of Information Systems", McGraw-Hill Education, New Delhi
3. Effy Oz, "Management Information Systems", Sixth Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
4. Robert G. **Murdick**, Joel E. **Ross**, James R. Claggett, "Information Systems for Modern Management", Third Edition, PHI Learning Pvt. Ltd., New Delhi.
5. Stephen **Haag**, Maeve **Cummings**, Amy **Philips**, "Management Information Systems", Sixth Edition, 2007, McGraw-Hill Education (India), New Delhi.
6. Gordon B. **Davis**, Margarethe H. **Olson**, "Management Information Systems", Second Edition, 1985, McGraw-Hill Education (India), New Delhi.
7. Mahadeo **Jaiswal**, Monika **Mital**, "Management Information Systems", First Edition, 2004, Oxford University Press, New Delhi.

MCL: 307 OPERATING SYSTEMS AND NETWORKS LAB

Topics

01. UNIX Structures, UNIX/LINUX Commands, Common Commands practice session.
 02. vi/vim editor basics, creating & managing files with vi/vim.
 03. Working with sed and awk, programming with awk.
 04. Shell scripting, shell variables, data types.
 05. Shell programming-control structures, loops etc.
 06. Creating processes- fork and join, pid, child process.
 07. Implementing Threads, Thread programming.
 08. Inter process communication-Producer & consumer.
 09. Implementing readers and writers problem using c/c++.
 10. Implementing sleeping barber problem using c/c++.
 11. Implementing semaphores using c/c++.
 12. Implementing deadlock mechanism using c/c++.
 13. Implementing bankers algorithm using c/c++.
 14. Simulation program for memory allocation & de-allocation.
 15. Implementing file allocation problem using c/c++.
 16. Socket programming in C: Client and server Sockets.
 17. Connection establishment through TCP/IP Sockets.
 18. Communicating with server w. r. t. clients via sockets
 19. Implementing a File copy program using Sockets.
 20. Creating and Installing Server Software.
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MCL: 308 DATABASE LABORATORY USING ORACLE

Topics

01. Installation of Oracle or MySQL.
 02. Learning basic DDL and DML commands
 03. Learning basic DCL and TCL commands.
 04. Insertion, Deletion, Updating to a table using SQL commands
 05. Working with dual table.
 06. Data retrieval using Select & where clause.
 07. Oracle inbuilt functions-Date, aggregate, group by etc.
 08. Use of Joins and Sub queries.
 09. Views, sequences and indexes.
 10. Managing users, privileges and roles.
 11. PL/SQL-Data types, control structures.
 12. Creating procedures with PL/ SQL.
 13. Error handling in PL/ SQL.
 14. Cursor Management in PL/ SQL.
 15. Sub program design in PL/ SQL.
 16. Writing Program segments in embedded SQL using C/C++.
 17. Writing Programs on Packages & triggers.
 18. Implementing OO features in Oracle.
 19. Report generation using SQL.
 20. Database backup & Recovery Management.
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MCL 309 COMMUNICATION AND INTERPERSONAL SKILLS FOR CORPORATE READINESS

Lab

30 hours

This course will focus on communication in professional (work-related) situations of the kind that BPUT graduates may expect to encounter on entering the professional domain. Some typical forms of work-related communication, oral or written, are listed below. Practice activities for all four skills can be designed around these or similar situations.

1. Gaining entry into an organization
 - i. Preparing job-applications and CVs
 - ii. Facing an interview
 - iii. Participating in group discussion (as part of the recruitment process)

- 2 In-house communication
 - a. Superior/ Senior → subordinate / junior (individual → individual / group)
 - i. Welcoming new entrants to the organization, introducing the workplace culture etc.
 - ii. Briefing subordinates / juniors : explaining duties and responsibilities etc.
 - ii. Motivating subordinates / juniors ('pep talk')
 - iii. Instructing/ directing subordinates/ juniors
 - iv. Expressing / recording appreciation, praising / rewarding a subordinate or junior
 - v Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking for an explanation etc.

 - b. Subordinate / Junior → Superior / Senior
 - i. Responding to the above
 - ii. Reporting problems / difficulties / deficiencies
 - iii. Offering suggestions

4TH Semester

MCC 401: PROGRAMMING WITH JAVA

Module – 1 (16 hours)

Introduction to Java Programming Language, Data Types and Operations, Structured Programming, Selection Statements, Loops, Methods, Method Abstraction and Stepwise Refinement, Arrays, Object-Oriented Programming: Classes and Objects, Constructors, Implementing & Designing Classes, Use of Keywords: `static`, `final`, `this`, Class Abstraction and Encapsulation, Strings and Text I/O, Inheritance and Polymorphism, use of `super` keyword, Overriding vs. Overloading, Object: The Cosmic Superclass, Abstract Classes and Interfaces, Packages, Object-Oriented Design and Patterns.

Module – 2 (12 hours)

GUI Programming: GUI Basics, Graphics, Event-Driven Programming, Creating User Interfaces, Applets and Multimedia, Exception Handling, Binary I/O, Files & Streams, Recursion, Dynamic Binding, Generics & Generic Programming, Java Collections Framework, Algorithm Efficiency, Searching & Sorting.

Module – 3 (12 hours)

Multithreading, Networking, JDBC, Internationalization, Advanced GUI Programming: MVC, JavaBeans and Bean Events, Containers, Layout Managers, and Borders, Menus, Toolbars, Dialogs and Swing Models, `JTable` and `JTree`, New Features of Java.

Text Books:

1. Y. Daniel Liang, “*Introduction to Java Programming: Comprehensive Version*”, 7th Edition, 2009, Pearson Education Inc., New Delhi.
(Book Chapters: 1 to 24, 26, 29 to 37)
2. Cay S. Horstmann, “*Big Java*”, 3rd Edition, Wiley India Pvt. Ltd., New Delhi.

Reference Books:

1. Richard A. Johnson, “*An Introduction to Java Programming and Object Oriented Application Development*”, First Edition, 2007, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. E. Balagurusamy, “*Programming with Java: A Primer*”, 3rd Edition, 2008, McGraw-Hill Education (India), New Delhi.
3. Harvey M. Deitel & Paul J. Deitel, “*Java How to Program*”, 8th Edition, 2009, PHI Learning Pvt. Ltd., New Delhi.
4. Mahesh P. Bhave & Sunil A. Patekar, “*Programming with Java*”, First Edition, 2009, Pearson Education, Inc. New Delhi.
5. P. Radha Krishna, “*Object-Oriented Programming through Java*”, First Edition, 2007, Universities Press (India) Pvt. Ltd., Hyderabad.

MCC 402 COMPUTER GRAPHICS AND MULTIMEDIA

Module – 1 (14 hours)

Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software, Introduction to OpenGL.

Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, fill methods for areas with irregular boundaries, Antialiasing.

Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations.

Two Dimensional Viewing: Viewing pipeline, Clipping Window, Normalization & Viewport coordinate Transformations, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping. Three Dimensional Viewing: 3-dimensional Viewing Concepts, Viewing pipeline, Projection Transformations (Orthogonal, Oblique parallel, Perspective), Clipping Algorithms.

Module – 2 (14 hours)

Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Shape Grammars.

Visible Surface Detection Methods: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer method, A-Buffer Method, Scan line and Depth Sorting, Area subdivision Method, Ray Casting Method.

Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations). Computer Animation, Hierarchical Modeling (introductory idea only).

Module – 3 (12 hours)

Multimedia Fundamentals: Introduction, Multimedia & Hypermedia, WWW, Multimedia software tools, Multimedia Authoring and Tools, Graphics and Image Data Representation, Color Models in images & video, Fundamental Concepts in Video, Basics of digital Audio.

Multimedia Data Compression: Lossless Compression Algorithms (Basics of Information Theory, Run length coding, variable length coding, lossless image compression), Lossy Compression Algorithms (distortion measure, quantization, Discrete Cosine transform), Basic Image Compression standard-JPEG, Basic Video Compression standard-MPEG (MPEG-1&2).

Text Books:

1. Donald **Hearn** & M. Pauline **Baker**, “*Computer Graphics with OpenGL*”, Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-Nian **Li** and Mark S. **Drew**, “*Fundamentals of Multimedia*”, First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Jennifer **Burg**, “*The Science of Digital Media*”, First Edition, 2009, Pearson Education Inc., New Delhi.
2. Francis S. **Hill** & Stephen M. **Kelly**, “*Computer Graphics using OpenGL*”, Third Edition, 2007, PHI Learning Pvt. Ltd., New Delhi.
3. Zhigang **Xiang**, Roy A. **Plastock**, “*Computer Graphics*”, Second Edition, 2007, McGraw-Hill Education (India), New Delhi.
4. Leen **Ammeral**, Kang **Zhang**, “*Computer Graphics for Java Programmers*”, Second Edition, 2007, Wiley India Pvt. Ltd., New Delhi.
5. Edward A. **Angel**, “*Interactive Computer Graphics: A Top-Down Approach Using OpenGL*”, Fifth Edition, 2009, Pearson Education Inc., New Delhi.

MCC 403 SOFTWARE ENGINEERING

Module-I

(12 hours)

Introduction: Evolution and impact of Software Engineering, Socio-technical Systems, Critical Systems, Software Processes, and Software Life cycle Models, Software Project Management.

Requirements & Specification: Software Requirements, Requirements Engineering Processes, Feasibility study, Requirements analysis and specification, System Models, Critical System Specification, Formal Specification.

Module-II

(14 hours)

Design and Analysis Aspects: Architectural Design – Cohesion and coupling, Abstraction, Data flow Oriented Design, Distributed Systems Architecture, Application Architectures, Object-Oriented Design, Real-time Software Design, User Interface Design and Usability Engineering.

Software Development: Rapid Software Development, Software Reuse: Design Patterns, Component Based Software Engineering (CBSE), Critical Systems Development, Software Evolution.

Implementation and Testing: Verification and Validation, Software Testing, Critical Systems validation.

Module-III

(14 hours)

Software Reliability and Quality Management: Musa's Reliability Model, Managing People, Software Cost Estimation— COCOMO Model, Quality Management, Process Improvement, Configuration Management, Software Maintenance, CASE Tools.

Modern Trends and Emerging Technologies: Humphrey's Capability Maturity Model, CMMI (Capability Maturity Model Integration), Agile software development, Extreme Programming (XP), Security Engineering, Service-oriented Software Engineering, Aspect-oriented Software Development.

Text Books:

1. Rajib Mall, "*Fundamentals of Software Engineering*", 2nd Edition, 2007, PHI Learning Pvt. Ltd. New Delhi.
2. Ian Sommerville, "*Software Engineering*", 8th Edition, 2007, Pearson Education Inc., New Delhi.

Reference Books:

1. Roger S. Pressman, "*Software Engineering: A Practitioner's Approach*", 7th International Edition, McGraw-Hill Education (Asia), Singapore.
2. Shari Lawrence Pfleeger, Joanne M. Atlee, "*Software Engineering*", 3rd Edition (2006), Pearson Education, Inc. New Delhi.
3. Ben Shneiderman, Catherine Plaisant, "*Designing the User Interface: Strategies for Effective Human-Computer Interaction*", 4th Edition (2006), Pearson Education, Inc. New Delhi.
4. Pankaj Jalote, "*Software Engineering*", First Edition, 2009, Wiley India Pvt. Ltd., New Delhi.
5. Dines Bjørner, "*Software Engineering: Volume-1, Volume-2 & Volume -3*", Springer India Pvt. Ltd., New Delhi.

MCC 404 COMPILER DESIGN

Module 1 (12 hours)

Introduction, Lexical Analysis (Scanning), Lexical-Analyzer Generators: Lex & Flex, Syntax Analysis (Parsing): CFG, Top-Down Parsing, Bottom-Up Parsing, LR Parsing Methods: SLR, Canonical LR, LALR, Parser Generators-YACC & BISON.
Semantic Analysis: Attribute Grammars & Syntax-Directed Translation Schemes (SDTS).

Module 2 (12 hours)

Intermediate-Code Generation Techniques, Type Checking, Run-Time Environments: Storage Organization, Allocation & Management of Stack and Heap, Garbage Collections, Register allocation and Code Generation.

Module 3 (16 hours)

Machine-Independent Optimizations, Interprocedural Analysis: Basic Concepts, Requirement of Interprocedural Analysis, Logical Representation of Data Flow, Pointer-Analysis Algorithm, Context-Insensitive Interprocedural Analysis, Context-Sensitive Pointer Analysis, Datalog Implementation.

Text Books:

1. Alfred V. **Aho**, Monica S. **Lam**, Ravi **Sethi**, Jeffrey D. **Ullman**, “*Compilers: Principles, Techniques, and Tools*”, 2nd Edition, 2007, Pearson Education Inc., New Delhi. [Chapters-1, 3 to 9 (excluding 7.8), 12]
2. Kenneth C. **Louden**, “*Compiler Construction: Principles and Practices*”, First Edition, 1997, CENGAGE Learning India Pvt. Ltd., New Delhi.

References Books:

1. Pat D. **Terry**, “*Compiling with C# and Java*”, 2006, Pearson Education Inc., New Delhi.
2. Dick **Grune**, Henri E. **Bal**, Cerial J. H. **Jacobs**, Koen **Langendoen**, “*Modern Compiler Design*”, First Edition (2000), Wiley India Pvt. Ltd., New Delhi.
3. Keith D. **Cooper**, Linda **Torczon**, “*Engineering a Compiler*”, First Edition (2004), Elsevier India Pvt. Ltd., New Delhi.
4. G. **Sudha Sadasivam**, “*Compiler Design*”, 2008, SCITECH Publications (India) Pvt. Ltd, Chennai.
5. David **Galles**, “*Modern Compiler Design*”, 2006, Dreamtech /Pearson Education Inc., New Delhi.

MCC: 405 QUANTITATIVE TECHNIQUE-I (OR)

Module-I (13 hours)

Introduction to Linear Programming: Problem formulation, graphical solution of LPP, Simplex algorithm, Big-O method, Two phase simplex method, Duality, Dual theorems, Transportation Problem, Assignment problem, Transshipment Problem.

Module-II (13 hours)

Queuing Theory: Basic structure of queuing model, Role of exponential distribution, Birth and death process, Queuing models based on Birth-and-death process, Queuing models based on Non-exponential distributions

Inventory Theory: Components of inventory models, Deterministic Continuous-Review model, deterministic Periodic-Review model, Deterministic Multiechelon inventory models for supply chain management.

Module-III (14 hours)

Project management: Visual display of a project, Scheduling a project with PERT/CPM, Dealing with uncertain activity, Time-cost trade-offs, Scheduling and controlling project costs, Evaluation of PERT/CPM

Decision analysis: Decision making without experimentations, Decision making with experimentations, Decision trees, Utility theory

Text Book:

1. Frederick S. Hiller, Gerald J. Lieberman, "*Introduction to Operations Research*", Eighth Edition, McGraw Hill Education, New Delhi

Reference Books:

1. W. L. Winston, "*Operations Research Application and algorithm*", Fourth Edition, CENGAGE Learning India Pvt Ltd, New Delhi.
2. Taha, "*Operations Research*", Eighth Edition, Pearson Education Inc, New Delhi
3. J. K. Sharma, "*Operations Research theory and application*", 3rd Edition MacMillan India Ltd.
4. Ravidran, Philips, Solberg, "*Operations Research, Principles and Practice*", Second Edition, John Wiley and Sons, 2006

MCC: 406 E-COMMERCE AND ERP

Module-I

(12 hours)

Introduction to e-commerce: Business models, revenue models and business processes, economic forces & e-commerce, identifying e-commerce opportunities, international nature of e-commerce, technology infrastructure-internet & WWW; Business strategies for e-commerce: Revenue models in transaction, revenue strategic issues, creating an effective web presence, website usability; Marketing on the web: Web marketing strategies, communicating with different market segments, customer behavior and relationship intensity, advertising on the web, e-mail marketing, technology enabled CRM, search engine positioning and domain names.

Module-II

(14 hours)

Business to business strategies: (Overview strategic methods for Developing E-Commerce) Purchasing, logistics and supply activities, electronic data interchange (EDI), electronic data interchange on the internet, supply chain management using internet technologies, electronic market place & portals (Home shopping, E-marketing, Tele marketing), auctions, online auctions, virtual communicative & web portals; legal, ethical & tax issues in e-commerce — use and protection of intellectual property in online business, online crime, terrorism & warfare, ethical issues.

Four C's (Convergence, Collaborative computing, Content management & Call centre)

Technologies for e-commerce: web server hardware & software, e-commerce software, e-commerce security — online security issues, security for client computers, communication channel security, security for server computers, organizations that promote computer security; Payment statements in e-commerce (Payment through card system, E-cheque, E-cash, E-payment threats and protection), planning for e-commerce— planning e-commerce initiatives, strategies for delivering e-commerce web sites, managing e-commerce Implementations.

Module-III

(14 hours)

Enterprise resource planning: Business functions, processes & data requirements, development of ERP systems, marketing information systems & sales order process, production & supply chain management information systems, accounting in ERP systems, human resource processes with ERP, process modeling, process improvement and ERP implementations, Relationship between e-commerce and ERP.

Text Books

1. Dave **Chaffey**, “*E-Business and E-Commerce Management*”, Third Edition, 2009, Pearson Education Inc., New Delhi.
2. Ellen Monk, Bret Wagner, “*Concepts in Enterprise Resource Planning*”, Second Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.

Reference Books:

1. Gary P. **Schneider**, “*Electronic Commerce*”, Seventh Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. K.K. Bajaj, D. Nag “*E-Commerce*”, 2nd Edition, McGraw Hill Education, New Delhi
3. P.T. Joseph, “*E-Commerce An Indian Perspective*”, PHI Publication, New Delhi.
4. Bhaskar Bharat, “*Electronic Commerce-Technology and Application*”, McGraw Hill Education, New Delhi
5. Mary **Sumner**, “*Enterprise Resource Planning*”, 2005, PHI Learning India Pvt. Ltd. / Pearson Education, Inc. New Delhi.
6. Chan, “*E-Commerce fundamentals and Applications*”, Wiley India, New Delhi

MCL: 407 PROGRAMMING WITH JAVA LABORATORY

Topic

01. Introduction, Compiling & executing a java program.
 02. Program with data types & variables.
 03. Program with decision control structures: if, nested if etc.
 04. Program with loop control structures: do, while, for etc.
 05. Program with classes and objects.
 06. Implementing data abstraction & data hiding.
 07. Implementing inheritance.
 08. Implementing and polymorphism.
 09. Implementing packages.
 10. Implementing generics.
 11. Program with modern features of java.
 12. Implementing interfaces and inner classes
 13. Implementing wrapper classes
 14. Implementing generics.
 15. Implementing cloning.
 16. Implementing Reflections
 17. Working with files.
 18. Implementing a Lexical Analyzer
 19. Implementing a parser
 20. Implementing a code generator
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MCL: 408 COMPUTER GRAPHICS AND MULTIMEDIA LAB

Topic

01. Introduction to OpenGL Programming.
 02. Implementing line drawing algorithms.
 03. Implementing circle drawing algorithms.
 04. Implementing ellipse drawing algorithms.
 05. Implementing Line Clipping Algorithms.
 06. Implementing Polygon Clipping Algorithms.
 07. Implementing 2-d Transformations.
 08. Implementing 3-d Transformations.
 09. Implementing scan fill, boundary fill algorithms.
 10. Implementing seed fill, flood fill algorithm.
 11. Writing program on B-Splines, Bezier Curves
 12. Writing program on Mandelbrot set & Julia set.
 13. Writing program on Sierpinski gasket, Koch curve.
 14. Writing program on Fractal trees & forest.
 15. Writing program on wire frame model & terrain generation.
 16. Implementing Ray tracing algorithm.
 17. Writing program on Animation & Morphing techniques.
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MCS409 – Seminar : (Each student must present a seminar & should attend seminar presentation of others student as per regulation prescribed by the University.)

5th Semester

MCC 501: **ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS** (3-1-0)

Module-1 (15 hours)

Artificial Intelligence: Introduction, Intelligent Agents: Agents & Environments, Concept of Rationality, Nature & Structure of Agents; Problem Solving: Solving Problems by Searching, Classical Search, Adversarial Search, Constraint Satisfaction Problems. Knowledge, Reasoning and Planning: Logical agents, First order logic, Inference in First order logic.

Module-2 (13 hours)

Classical planning, Knowledge Representation; Uncertain Knowledge and Reasoning: Probabilistic Reasoning, Learning from Examples, Knowledge in Learning; Natural Language Processing: Language models, Text Classification, information retrieval, information extraction

Module-3 (12 hrs)

Natural Language for Communication: Phrase structure Grammars, Syntactic Analysis, Augmented grammars and semantic interpretation, Machine translation, Speech recognition; Perception; Expert Systems: Introduction, Design of Expert systems.

Text Books:

1. Stuart **Russell** and Peter **Norvig**, "Artificial Intelligence: A Modern Approach", Third Edition, 2010, Pearson Education, New Delhi.
Chapters: 1, 2, 3, 4 (4.1, 4.2), 5 (5.1, 5.2, 5.3), 6, 7, 8, 9, 10 (10.1, 10.2, 10.3, 10.5), 12, 14 (14.1-14.6), 18 (18.1- 18.7), 19 (19.1, 19.2, 19.3), 22, 23, 24 (24.1-24.3, 24.5).
2. Joseph **Giarratano** and Gary **Riley**, "Expert Systems: Principles and Programming", Fourth Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.
Chapters: 1 and 6.

Reference Books:

1. Elaine A. **Rich** and Kevin **Knight**, "Artificial Intelligence", 3rd Edition, 2009, McGraw-Hill Education (India), New Delhi.
2. Nils J. **Nilsson**, "Artificial Intelligence: A New Synthesis", 2nd Edition, 2000, Elsevier India Publications, New Delhi.
3. Michael **Negnevitsky**, "Artificial Intelligence: A Guide to Intelligent Systems", Second Edition, 2005, Pearson Education, Inc. New Delhi.
4. Dan W. **Patterson**, "Introduction to Artificial Intelligence and Expert Systems", 1st Edition, 1996, PHI Learning Pvt. Ltd., New Delhi.
5. Ben **Coppin**, "Artificial Intelligence Illuminated", 2005, Narosa Publication, New Delhi. ISBN: 978-81-7319-671-3

MCC 502: **OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML** (3-0-0)

Module-I (15 hours)

Introduction: Object orientation & Object oriented development, Modeling Concepts: Modeling as a design technique, Class Modeling, advanced class modeling, State Modeling, advanced State Modeling, Interaction Modeling, advanced Interaction Modeling.

Module-II (13 hours)

Analysis and Design: Process overview, system Conception, Domain Analysis, System Design, Class design.

Module-III (12 hours)

Implementation: Implementation Modeling, Object Oriented (OO) Languages, Databases, Programming Style.

Text Books:

1. Michael R. **Blaha** and James R **Rumbaugh**, “Object-Oriented Modeling and Design with UML”, Second Edition, 2005, Pearson Education, Inc. New Delhi.
Chapters: 1 to 8, 10, 11, 12, 14, 15, 17, 18, 19, 20.
2. Mark **Priestley**, “Practical Object-Oriented Design with UML”, Second Edition, 2006, McGraw-Hill Education, India. New Delhi.

Reference Books:

1. Grady **Booch**, “Object-Oriented Analysis and Design with Applications”, Third Edition, 2007, Pearson Education, Inc. New Delhi.
2. Craig **Larman**, “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition, 2005, Pearson Education, Inc. New Delhi.
3. Mike **O'Docherty**, “Object Oriented Analysis and Design: Understanding System Development with UML 2.0”, 2005, Wiley India Pvt. Ltd., New Delhi.
4. John W. **Satzinger**, Robert B. **Jackson**, Stephen D. **Burd**, “Object-Oriented Analysis and Design with the Unified Process”, 2006, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. James **Rumbaugh**, Grady Booch, Ivar Jacobson, “The Unified Modeling Language Reference Manual”, 2nd Edition, 2004, Pearson Education, Inc. New Delhi.

MCC 503: **INTERNET TECHNOLOGY AND ENTERPRISE
JAVA** (3-1-0)

Module-I (15 hours)

Internet and Web Technology: Introduction and overview, Internetworking concept and architectural model, classful internet addresses, classless and subnet address extensions (CIDR), Protocol Layering, , Mobile IP, Client Server model, World wide web, Voice and Video over IP.

Web Programming:- Web 2.0, Web Browsers, Web Servers, URLs, URN, URI, Basics of HTML & XHTML Programming: Syntax, Document structures, images, hyperlinks, List, Tables, Forms, Frames, CSS, Basic JavaScript Programming: DOM, Loops, function and arrays. XML: Document structure, DTD, Namespaces, XML Schema, and Parsing XML documents.

Module-II (15 hours)

Enterprise Java Programming: Overview, Java EE 6 API, Web Applications, Java Servlet Technology: - Lifecycle of a Servlet, Servlet API, Servlet Packages, Types of servlets, Database Access, Stateless and Stateful protocols, Session Tracking. JSP Technology: - Architecture & Anatomy of JSP Page, JSP life cycle, JSP with MVC Architecture, Dynamic webpage Creation, Scripting Elements, Session Tracking, Database access, JSTL, JavaServer Faces (JSF) Technology, Facelets, Ajax.

Module-III (10 hours)

Web Services: Building Web services with JAX-WS, Enterprise JavaBeans Technology: EJB Component Architecture, Role of EJB & its life cycle, Types of Beans, Stateless and stateful beans, Security features of EJB, Contexts and Dependency Injection for the Java EE Platform; Java Persistence API, Security in Java EE, Java EE Supporting Technologies: Introduction, Transactions and Resource Connections.

Recommended Books:

1. Douglas E. **Comer**, "Internetworking with TCP/IP, Volume 1: Principles, Protocols and Architecture", Fifth Edition, 2006, PHI Learning Pvt. Ltd., New Delhi.
Chapters: 1, 3, 4, 9, 10, 18, 20, 27, 28.
2. Ralph **Moseley**, "Developing Web Applications", 2008, Wiley India, New Delhi.
3. Eric **Jendrock**, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, "The Java EE6 Tutorial", Volume-1, Fourth Edition, 2010, Pearson India, New Delhi.
Chapters: 1, 3, 4, 5, 7, 9 to 12, 14 to 16, 17, 19, 23, 26, 27, 28.

References:

1. Joe **Wigglesworth**, Paula **McMillan**, "Java Programming: Advanced Topics", 3rd Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. William **Stallings**, "Computer Networking with Internet Protocols and Technology", 2004, Pearson education, New Delhi.
3. **Kongent S.**, "Java Server Programming (JEE 6) Black Book, Platinum Edition", 2008, Dreamtech / Wiley India Pvt. Ltd.
4. David **Geary**, Cay S. **Horstmann**, "Core JavaServer Faces", Second Edition, 2007, Pearson Education, Inc. New Delhi.
5. Adrian **Farrel**, "The Internet and its Protocols: A Comparative Approach", 2005, Elsevier India Pvt. Ltd., New Delhi.

MCC 504: Quantitative Techniques-II (3-0-0)

Module-1 (12 hours)

Markov Chain: Stochastic Processes, Markov chains, Chapman-Kolmogorov equations, States of a Markov chain, Properties of Markov chains, Continuous time Markov chains. Markov Decision Process: Model for Markov decision Process, Linear programming and optimal policies, Policy improvement algorithm, Discounted cost criterion

Module-2 (12 hours)

Random numbers, Pseudo random number generation, Using random numbers to evaluate integrals, Generation of discrete random variables: Inverse transform method, generating Poisson and Binomial random variables, the acceptance – rejection technique
Generating continuous random variable : The inverse transform algorithm, the rejection method, the polar method for generating normal random variables, generating Poisson process.

Discrete event simulation approach: Simulation via discrete event, the single server queuing system, Queuing system with two servers in series and with two parallel servers, Inventory model.

Module-3 (12 hrs)

Variance reduction technique: Use of antithetic variable, use of control variates, variance reduction by conditioning, stratified sampling, Importance sampling.

Statistical validation techniques: Goodness of fit tests, Chi-square goodness of fit test for discrete data, Kolmogorov- Smirnov test for continuous data, Goodness of fit test when some parameters are unspecified, two sample problem.

Text Books

1. Frederick S. **Hiller**, Gerald J. **Lieberman**, "Introduction to Operations Research", McGraw Hill Education India Pvt. Ltd, Eighth edition, 2008, New Delhi.
2. Sheldon M. **Ross**, "Simulation", Academic Press(an imprint of Elsevier), Fourth edition

Reference Books:

1. Hamdy A.Taha,"Operations research", Pearson Education India, New Delhi
2. Jerry **Banks**, John S. **Carson II**, Barry L. **Nelson**, David M. **Nicol**, "Discrete Event System Simulation", 5th Edition, 2010, Pearson education Inc. New Delhi.
3. Andrew **Seila**, Vlatko **Ceric**, Pandu **Tadikamalla**, "Applied Simulation Modeling", 1st Edition, 2009, Cengage Learning pvt. Ltd. New Delhi.
4. Manuel D. **Rossetti**, "Simulation, Modeling and Arena", First Edition, 2009, Wiley India Pvt. Ltd. New Delhi.
5. Bernard P. **Zeigler**, Herbert **Praehofer**, Tag Gon **Kim**, "Theory of Modeling and Simulation", 2nd Edition, 2000, Academic Press/ Elsevier India Pvt. Ltd, New Delhi.

MCE 505: **DISTRIBUTED SYSTEMS** (3-0-0)

Module-I (12 hours)

Distributed systems: Definition, goals, types of Distributed Systems, Architectures, Key characteristics-resource sharing openness, concurrency, scalability, fault tolerance, transparency; Design issues, naming, communication, software structure, workload allocation, consistency maintenance; User requirement, functionality, Quality of service, reconfigurability; Interprocess communication, building blocks, client server communication; CORBA's Common Data Representation (CDR); Java object serialization; Extensible markup language (XML); Remote object references; Inter-process communication in UNIX; Remote procedure calling; Design issues, interface definition language exception handling; Implementation - interface processing, communication handling; Binding, Case study: sun RPC Vs. Java RMI.

Module-II (12 hours)

Distributed Operating systems: kernel, processes and threads, Naming and protection - Communication and Invocation, virtual memory, Distributed file services - design issues, interfaces, implementation techniques, Case study sun NFS, Name services: Name spaces; Name resolution, Domain Name System, SNS and DNS, Peer-to-Peer Systems. Coordination and Agreement: Time and Global States, Time and co-ordination, Synchronizing physical clocks- logical time and logical clocks, Distributed co-ordination, distributed mutual exclusion, elections, Replication, basic architectural model, consistency and request ordering.

Module-III (12 hours)

Distributed Transactions, Recovery and fault tolerances: Transaction recovery, logging - shadow versions, fault model for transaction; Fault tolerance: characteristics; Hierarchical and group masking of faults; Security, authentication and key distribution, logic of authentication, digital signatures; Web Services: SOAP, XML, CORBA, Distributed object based systems, Distributed file systems, Distributed web- based systems, Distributed co-ordination based systems.

Text Books:

1. George **Coulouris**, Jean **Dollimore** and Tim **Kindberg**, "*Distributed Systems: Concepts and Design*", Fourth Edition, 2006, Pearson Education, Inc. New Delhi.
2. Andrew S. **Tanenbaum**, Maarten **van Steen**, "*Distributed Systems: Principles and Paradigms*", 2nd Edition, 2007, PHI Learning Pvt. Ltd., New Delhi.

Reference Texts:

1. Hagit **Attiya**, Jennifer **Welch**, "*Distributed Computing: Fundamentals, Simulations, and Advanced Topics*", 2nd Edition, 2005, Wiley India Pvt. Ltd., New Delhi.
2. Mordechai **Ben-Ari**, "*Principles of Concurrent and Distributed Programming*", 2nd Edition, 2006, Pearson Education, Inc. New Delhi.
3. Mei-Ling **Liu**, "*Distributed Computing: Principles and Applications*", 2004, Pearson Education, Inc. New Delhi.
4. Gerard **Tel**, "*Introduction to Distributed Algorithms*", Second edition, 2002, Cambridge University Press / Foundation Books India, New Delhi.
5. Ajay D. **Kshemkalyani**, Mukesh **Singhal**, "*Distributed Computing: Principles, Algorithms, and Systems*", 2008, Cambridge University Press / Foundation Books India, New Delhi.

MCE 506: **PARALLEL COMPUTING** (3-0-0)

Module-I (12 hours)

Introduction to Parallel Computing; Motivating Parallelism, Scope of Parallel Computing; Parallel Programming; Platforms : Implicit parallelism, Limitation of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs of Parallel Machines, Routing Mechanism for Interconnection Networks, Impact of Process-processor Mapping and Mapping Techniques.

Module-II (12 hours)

Principles of Parallel Algorithm Design : Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for containing interaction Overheads, parallel Algorithm Models. Analytical Modelling of Parallel Programs : Sources of Overhead in Parallel Programs, Performance metrics for parallel systems, the effect of Granularity on Performance, Scalability of Parallel Systems, minimum Execution time and minimum cost-optimal Execution Time, Asymptotic Analysis of Parallel Programs, other Scalability Metrics.

Module-III (12 hours)

Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, Scatter and Gather, All-to-All Personalized Communication, Circular Shift.

Introduction to MPI Principles of Message - Passing Programming, The Building Blocks (Send and Receive Operations), MPI (the Message Passing Interface), Collective Communication and Computation Operations, Examples of Matrix - Matrix multiplication, One dimensional Matrix Vector Multiplication using MPI.

Text Books:

1. Ananth **Grama**, George **Karypis**, Vipin **Kumar**, Anshul **Gupta**, "Introduction to Parallel Computing", 2nd Edition, 2004, Pearson Education, Inc. New Delhi.
2. Michael J. **Quinn**, "Parallel Computing: Theory and Practice", 1994, McGraw-Hill Education (India), New Delhi.

Reference Books:

1. Calvin **Lin**, Larry **Snyder**, "Principles of Parallel Programming", 1st Edition, 2009, Pearson Education, Inc. New Delhi.
2. Michael J. **Quinn**, "Parallel Programming in C with MPI and OpenMP", 2004, McGraw-Hill Education (India), New Delhi.
3. Barry **Wilkinson**, "Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers", 2nd Edition, 2005, Pearson Education, Inc. New Delhi.
4. Yves **Robert**, Henri **Casanova**, Armand **Legrand**, "Parallel Algorithms", 1st Edition, 2009, CRC Press. ISBN-13:9781584889458.
5. Harry F. **Jordan**, Gita **Alagband**, "Fundamentals of Parallel Processing", first Edition, 2003, PHI Learning Pvt. Ltd. New Delhi.

MCE 507: **IMAGE PROCESSING** (3-0-0)

Module-I (12 hours)

Introduction: The digitized image and its properties: Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Module-II (12 hours)

Image preprocessing: Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local preprocessing- image smoothing, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local preprocessing and adaptive neighborhood pre processing; image restoration.

Image Segmentation: Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection.

Module-III (12 hours)

Mathematical Morphology: Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation -particles segmentation and watersheds, particles segmentation.

Image textures: Statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method applications.

Image representation and description: Representation, boundary descriptors, regional descriptors

Text Books:

1. Rafael C. **Gonzalez**, Richard E. **Woods**, "*Digital Image Processing*", 3rd Edition, 2008, Pearson Education, Inc. New Delhi.
2. Milan **Sonka**, Vaclav **Hlavac**, Roger **Boyle**, "*Image Processing, Analysis, and Machine Vision*", 3rd Edition, 2008, CENGAGE Learning, New Delhi.

Reference Book:

1. William K. **Pratt**, "*Digital Image Processing: PIKS Scientific Inside*", 4th Edition, 2008, Wiley India Pvt. Ltd., New Delhi.
2. Bernd **Jähne**, "*Digital Image Processing*", 6th Revised and Extended Edition, 2006, Springer Science. ISBN 978-3-540-24035-8.
3. Anil K. **Jain**, "*Fundamentals of Digital Image Processing*", 1989, PHI Learning Pvt. Ltd. New Delhi.
4. Kenneth R. **Castleman**, "*Digital Image Processing*", 1996, Pearson Education, Inc.
5. Bhabatosh **Chanda** & Dwijesh **Dutta** Majumder, "*Digital Image Processing and Analysis*", First Edition, 2000, PHI Learning Pvt. Ltd., New Delhi.

MCE 508: **WEB ENGINEERING** (3-0-0)

Module-I (12 hours)

Web-based Systems, Web Engineering, A Web Engineering Process, Communication, Planning.

Module-II (12 hours)

Modeling Activity, Analysis Modeling For Web Applications, Web Application Design, Interaction Design, and Information Design.

Module-III (12 hours)

Functional Design, Construction and Deployment, Design Patterns, Technologies and Tools, Web Applications Testing, Change and Content Management, Future Directions.

Text Books:

1. Roger S **Pressman**, David **Lowe**, "Web Engineering: A Practitioner's Approach", 1st Edition, 2008, McGraw Hill Education (India), New Delhi.
2. Emilia **Mendes**, Nile **Mosley**, "Web Engineering", 2006, Springer India Pvt. Ltd. New Delhi.

Reference Books:

1. Gustavo **Rossi**, Oscar **Pastor**, Daniel **Schwabe** and Luis **Olsina**, "Web Engineering: Modeling and Implementing Web Applications", 2007, Springer India Pvt. Ltd. New Delhi. ISBN: 978-1-84628-922-4.
2. Woojong **Suh**, "Web Engineering: Principles and Techniques", IGI Global, 2006, ISBN-13: 978-1591404330
3. Gerti **Kappel**, Birgit Prýýll, Siegfried Reich, Werner Retschitzegger, "Web Engineering: The Discipline of Systematic Development of Web Applications", 2007, John Wiley & Sons Inc. / Wiley India Pvt. Ltd., New Delhi. ISBN-13: 978-0470015544
4. Daniel M. **Brandon**, "Software Engineering for Modern Web Applications: Methodologies and Technologies", IGI Global, 2009, ISBN-13: 978-1599044927.

MCE 509: **COMPUTER SECURITY** (3-0-0)

Module-I (12 hours)

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense; Elementary Cryptography: Substitution Ciphers, Transpositions, Making “Good” Encryption Algorithms, Private-Key Cryptosystems, The Data Encryption Standard, The AES Encryption Algorithm, Public-Key Cryptosystems, Public Key Encryptions, Uses of Encryption, Pseudo-randomness, and Hashing.

Module-II (12 hours)

Program Security : Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purpose operating system protected objects and methods of protection memory and address protection, File protection Mechanisms, User Authentication Designing Trusted O.S : Security polices, models of security, trusted O.S. design, Assurance in trusted OS, Implementation examples. Digital Signatures, Authentication, Secret Sharing, Group-oriented cryptography, Identification.

Module-III (12 hours)

Data base & Network Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security; Security in Network; Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail.

Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security; The Economics of Cyber security; Privacy in Computing; Legal and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Case studies of Ethics.

Textbooks:

1. Charles P. **Pfleeger** & Shari Lawrence **Pfleeger**, “*Security in Computing*”, Fourth Edition, 2007, Pearson Education, Inc. New Delhi.
2. Josef **Pieprzyk**, Thomas **Hardjono**, Jennifer **Seberry**, “*Fundamentals of Computer Security*”, 2003, Springer & Universities Press India, New Delhi.

Reference Books:

1. Dieter **Gollmann**, “*Computer Security*”, Second Edition, 2006, Wiley India Pvt. Ltd., New Delhi.
2. William **Stallings** & Lawrie **Brown**, “*Computer Security: Principles and Practice*”, First Edition, 2008, Pearson Education, Inc. New Delhi.
3. Charlie **Kaufman**, Radia **Perlman** & Mike **Speciner**, “*Network Security: Private Communication in a Public World*”, 2nd Edition, 2003, PHI Learning. New Delhi.
4. Chuck **Easttom**, “*Computer Security Fundamentals*”, First Edition, 2006, Pearson Education, Inc. New Delhi.
5. Alfred **Baasta**, “*Computer Security*”, First edition, 2008, CENGAGE Learning.

MCE 510: **SOFTWARE DESIGN** (3-0-0)

Module-I (12 hours)

Software Architecture: Introduction, Architectural Styles, Shared Information Systems, Architectural Design Guidance, Formal Models and Specifications, Linguistic Issues.
Role of Software Design: Nature of the Design Process, Software Design Process, Design in the Software Development Process, Design Qualities.

Module-II (12 hours)

Transferring Design Knowledge: Describing a Design Solution, Transferring Design Knowledge, Design Representations, and Rationale for Method, Design Processes and Design Strategies, Design Patterns.

Module-III (12 hours)

Design Principles: Correctness and Robustness, Flexibility, Reusability, and Efficiency.
Design Practices: Stepwise Refinement, Incremental Design, Structured Systems Analysis and Structured Design, Jackson Structured Programming, Jackson System Development, Designing with Objects, Component-Based Design, Formal Approach to Design.

Text Books:

1. Mary **Shaw**, David **Garlan**, "Software Architecture: Perspectives on an Emerging Discipline", 2005, PHI Learning Pvt. Ltd, New Delhi.
2. David **Budgen**, "Software Design", 2nd Edition, 2004, Pearson Education Inc. New Delhi.

Reference Books:

1. Eric J. **Braude**, "Software Design: From Programming to Architecture", 2004, Wiley India Pvt. Ltd., New Delhi.
2. Nick **Rozanski**, Eóin **Woods**, "Software Systems Architecture: Working With Stakeholders Using Viewpoints and Perspectives", 2006, Pearson Education, Inc. New Delhi.
3. Len **Bass**, Paul **Clements**, Rick **Kazman**, "Software Architecture in Practice", 2nd Edition, 2004, Pearson Education, Inc. New Delhi.
4. Hong **Zhu**, "Software Design Methodology: From Principles to Architectural Styles", 2006, Butterworth-Heinemann / Elsevier India Pvt. Ltd., New Delhi.
5. Richard N. **Taylor**, Nenad **Medvidovic**, Eric **Dashofy**, "Software Architecture: Foundations, Theory, and Practice", 2009, Wiley India Pvt. Ltd., New Delhi.

MCE 511: **BIOINFORMATICS** (3-0-0)

Module-I (12 hours)

Molecular Biology and Biological Chemistry: The Genetic Material, Gene structure and Information Content, Protein Structure and Function, The nature of Chemical bonds, Molecular Biology Tools, Genomic Information Content, *Data Searches and Pairwise Alignments*: Dot Plot, Simple Alignments, Gaps, Scoring Matrices, Needleman and Wunsch Algorithm, Global and local Alignments, Database searches, Multiple sequence Alignments, *Substitution Patterns*: Patterns of substitutions within Genes, Estimating Substitution numbers, Variations in evolutionary rates between Genes, Molecular clocks, evolution in Organelles.

Module-II (12 hours)

Distance based methods of Phylogenetics: History of Molecular Phylogenies, Phylogenetic trees, Distance matrix methods, Maximum likelihood approaches, Multiple sequence Alignments, *Character Based methods of Phylogenetics*: Parsimony, Inferred ancestral sequences, Strategies for Faster searches, Consensus trees, tree confidence, Comparison of Phylogenetic methods, Molecular Phylogenies.

Module-III (12 hours)

Genomics and Gene Recognition: Prokaryotic genomes, Prokaryotic gene structure, GC-content Prokaryotic genomes, Prokaryotic gene density, Eukaryotic genomes, Eukaryotic gene structure, Open reading frames, GC-content Eukaryotic genomes, Gene expression, Transposition, Repetitive elements, Eukaryotic gene density, *Protein and RNA structure prediction*: Amino acids, Polypeptide composition, Secondary structure, Tertiary and quaternary structure, Algorithms for Modeling Protein Folding, Structure prediction, Predicting RNA secondary structures, *Proteomics*: from Genomes to Proteomes, Protein classification, Experimental techniques, Inhibitors and drug design, Ligand screening, X-ray crystal structures, NMR structures, Empirical methods and prediction techniques, Postranslational modification prediction.

Text Books:

1. Dan E. **Krane**, Michael L. **Raymer**, "*Fundamental Concepts of Bioinformatics*", First Edition, 2003, Pearson Education, Inc. New Delhi.
2. Teresa **Attwood**, David **Parry-Smith**, "*Introduction to Bioinformatics*", 1999, Pearson Education, Inc. New Delhi.

Reference Books:

1. Shuba **Gopal**, A. **Haake**, R. P. **Jones**, P. **Tymann**, "*Bioinformatics: A Computing Perspective*", First Edition, 2009, McGraw-Hill Education (India), New Delhi.
2. Yi-Ping P. **Chen**, "*Bioinformatics Technologies*", 2006, Springer India Pvt. Ltd., New Delhi.
3. Arthur **Lesk**, "*Introduction to Bioinformatics*", 2009, Oxford University Press, ISBN-13: 978-0199208043.
4. Bryan **Bergeron**, "*Bioinformatics Computing*", 2003, PHI Learning. New Delhi.
5. Zoe Lacroix, Terence Critchlow, "*Bioinformatics: Managing Scientific data*", 2009, Elsevier India Pvt. Ltd., New Delhi.

Module-I (10 hours)

Introduction to intelligent systems and soft computing: Introduction, Intelligent systems, Knowledge-based systems, Knowledge representation and processing, soft computing. Fundamentals of fuzzy logic systems: Introduction, background, fuzzy sets, generalized fuzzy operations, implication, definitions, fuzziness and fuzzy resolution, fuzzy relations, composition and inference, considerations of fuzzy decision making.

Module-II (10 hours)

Fundamentals of artificial neural networks: introduction, learning and acquisition of knowledge, features of artificial neural networks, fundamentals of connectionist modeling. Classes of neural networks: introduction, multilayer perceptron, radial basis function networks, Kohonen's self-organizing network, Hopfield network, industrial and commercial applications of ANN.

Module-III (10 hours)

Neuro-fuzzy systems: introduction, background, architectures of neuro-fuzzy systems, construction of Neuro-fuzzy systems. Evolutionary computing: introduction, overview, genetic algorithms and optimization, the schema theorem, genetic algorithm operators, integration of genetic algorithms with neural networks, integration of genetic algorithms with fuzzy logic, known issues in GAs, population-based incremental learning, evolutionary strategies, ES applications.

Text Books:

1. Fakhreddine O. **Karray**, Clarence **De Silva**, "Soft Computing and Intelligent Systems Design: Theory, Tools and Applications", Pearson Education, New Delhi.
Chapters: 1, 2, 4, 5, 7 and 8.
2. Jyh-Shing Roger **Jang**, Chuen-Tsai **Sun**, Eiji **Mizutani**, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", 1996, PHI Learning Pvt. Ltd. New Delhi.

Reference Books:

1. S. N. **Sivanadam**, S. N. **Deepa**, "Principles of Soft Computing", First Edition, 2008, Wiley India Pvt. Ltd. New Delhi.
2. Frank **Hoffmann**, M. **Köppen**, F. **Klawonn**, R. **Roy**, "Soft Computing: Methodologies and Applications", 2006, Springer, New Delhi.
3. D. K. **Prathihar**, "Soft Computing", 2007, Narosa Publication, New Delhi.
4. A. K. **Srivastava**, "Soft Computing", 2009, Morgan & Claypool / Narosa, New Delhi.
5. N. K. **Sinha**, "Soft Computing and Intelligent Systems: Theory and Applications", 2009, Elsevier India Pvt. Ltd, New Delhi.

CL 513: **SOFTWARE DESIGN USING UML LAB** (0-0-3)

Prerequisite: software engineering and Object Oriented Analysis & Design with UML.

Designing Tools: Rational rose/ Open Source NetBean.

The students are advised to design the different case studies correlating to their Theory paper.

Topic	
01.	Developing the Building blocks of UML: things, relationships and diagrams.
02.	Generating the Following through UML: a) Class diagram b) Object diagram c) Use case diagram d) Sequence diagram e) Collaboration diagram f) Activity diagram g) Statechart diagram h) Component diagram i) Deployment diagram
03.	Design the following systems through UML: a) OnlineBookShop Management System b) Bank Management System c) Library Management System d) University Management System e) Railway Information System

MCL 514: **ENTERPRISE WEB COMPUTING WITH JAVA LAB** (0-0-6)

Topics	
01.	HTML & XHTML Programming: basic tags, text formatting tags, creating hyperlinks.
02.	HTML & XHTML Programming: tables, lists, frames, forms, maps, Creating CSS.
03.	JavaScript Programming: Data types, loops, functions.
04.	JavaScript Programming: DOM, arrays, forms, frame, GUI design.
05.	XML Programming: page creation, making a DTD, Parsing XML files.
06.	Creating, installation and running a web server (e.g. Apache Tomcat/ GlassFish).
07.	Creating, Compiling and Running a Servlet. Program (both http & generic servlet).
08.	Implementing session tracking mechanisms in servlets.
09.	Generating Dynamic web content using Servlet basing upon request response model.
10.	DHTML programming: GUI designs.
11.	Creating a JSF program showing framework based application development.
12.	Creating, Compiling and Running a JSP Program.
13.	Implementing Session tracking through JSP Program.
14.	Access to a database using Servlet/JSP program.
15.	Creating a simple Java Bean Application programs using BDK. Tools.
16.	Deploying of beans, implementing entity beans and session beans of EJB.
17.	Creating manifest file, jar file and Deploying a web application.
18.	Designing a simple Program using JDBC, beans and JSP implementing MVC Model.
19.	Creating a RMI Program showing Marshalling and Unmarshalling Processes.
20.	A Web based Capstone project university management system using JSP and Database..

MCP 601: Project Work (for 16 weeks) Credit 20

There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert, internal supervisor and teachers of the department.

Each student must have an internal supervisor who is a faculty of the department/ Institution. Each student must submit the abstract of the project which will be approved by the department on the recommendation of the internal supervisor. .

Guidelines: SUMMARY/ABSTRACT

All students must submit a summary/abstract of the project to be undertaken to the internal supervisor for approval, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up should include the followings-

1. Name / Title of the Project
2. Statement about the Problem
3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. Testing Technologies used
8. What contribution would the project make?

After the approval, the student is allowed to carry out the project in any organization/ Institution. He/She must immediately inform the internal supervisor about the name and contact details of the external supervisor in the organization/Institution. Moreover he must report to the internal supervisor about the progress of his/her work periodically. After the end of 16 weeks, the student is required to submit the project report in the department after getting approved by the internal and external supervisors.

Guidelines for preparation of the final project report

Good quality white executive bond paper of A4 size should be used for typing and duplication with the following specification

Left margin	: 3.0cm
Right margin	: 2.0cm
Top margin	: 2.5cm
Bottom margin	: 2.5cm

Page numbers: All text pages as well s the Program source code should be numbered in the bottom center of the pages.

Font size of the normal Text	:12pt Times New Roman
Font size of Paragraph Heading	:14pt Times New Roman
Font Size of chapter Heading	:18pt Times New Roman
Font size of Code	:10pt Courier New

Format of the Project report

Cover page

Certificate of the internal supervisor

Certificate of the external supervisor

Self certificate

Acknowledgement

List of abbreviations, figures, Tables

Synopsis of the project (3-4 pages)

Main Report

Objective and scope of the project

Theoretical background

Definition of the problem

System Analysis and design

System planning

Methodology adopted

System implementation

System maintenance and Evaluation

Cost benefit Analysis

Detail life cycle of the project

Test reports (print out of the reports)

Print out of the code

References

Every student has to submit the followings

- (a) One hard copy of the Project report
- (b) Soft copy of the project on CD(to be submitted to the University) on a cover mentioning the name of the project, name of the student, Regd No. , name of the college, Year
- (c) Five copies of the synopsis of the project report

Evaluation of the Project

Evaluation of the project will be done by a jury of experts including one external expert, Head of the Department, internal supervisor, two teachers of the department. The evaluation will be done on the basis of the followings

Presentation : 30 Percentile

Viva-Voce : 20 Percentile

Project report : 50 Percentile

Number of students in a project should not be more than one. In some cases if the project completion needs more than 16 weeks, then two students may be allowed on the recommendation of the supervisors. However, they should handle different modules of the project.
