GULBARGA UNIVERSITY, GULBARGA
DEPARTMENT OF COMPUTER SCIENCE

SYLLABUS FOR
MASTER OF SCIENCE (M.Sc.)
In
COMPUTER SCIENCE

(Revised syllabus with effect from 2008-2009 and onwards)

MASTER OF SCIENCE (M.Sc.) in COMPUTER SCIENCE SYLLABUS

(With effect from the academic year 2008-2009 and onwards)

I Semester: (With effect from the academic year 2008-2009 and onwards)

MSC 1.1 Digital Electronics and Computer Design
MSC 1.2: Mathematical Foundation for Computer Science
MSC 1.3: Data Structures Using C++
MSC 1.4: Operating System Principles
MSC 1.5: Programming Laboratory –I: OOPs and Data Structure Lab.
MSC 1.6: Programming Laboratory – II: OS and Digital Electronics Lab.

II Semester: (With effect from the academic year 2008-2009 and onwards)

MSC 2.1: Design and Analysis of Algorithms
MSC 2.2: Database Management System
MSC 2.3: System Software and Compilers
MSC 2.4: Data Communications and Computer Networks
MSC 2.5: Programming Laboratory-III: DBMS and Networks Lab.
MSC 2.6: Programming Laboratory – IV: Visual Programming Lab.

III Semester: (With effect from the academic year 2009-2010 and onwards)

MSC 3.1: Software Engineering
MSC 3.2: Modeling and Simulation
MSC 3.3: Computer Graphics
MSC 3.4: Java Programming and Internet Technology
MSC 3.5: Programming Laboratory – V Simulation and Graphics Lab.
MSC 3.6: Programming Laboratory – VI JAVA and Internet Lab.

IV Semester: (With effect from the academic year 2009-2010 and onwards)

MSC 4.1: Object Oriented Analysis and Design using UML
MSC 4.2: Optimization Techniques
MSC 4.3: Elective-I
MSC 4.4: Elective-II
MSC 4.5: Programming Laboratory – VI OT and Elective Lab.
MSC 4.6: Programming Laboratory – VII Project Work

Elective – I:	**Elective – II:**
MSC4.3a: Bioinformatics	MSC4.4a: Data Warehousing and Mining
MSC4.3b: Artificial Intelligence	MSC4.4b: Component Technologies
MSC4.3c: Neural Networks and Fuzzy Systems	MSC4.4c: Advanced Computer Architecture
MSC4.3d: Theory of Computation	MSC4.4d: Mobile Communications
MSC4.3e: Pattern Recognition	MSC4.4e: Principles of Management
MSC4.3f: Digital Image Processing	MSC4.4f: Embedded Systems

M.Sc. I Semester

MSC1.1: Digital Electronics and Computer Design

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

UNIT–I
Digital computers and digital systems, binary numbers, number base conversion, octal and hexadecimal numbers, complements, binary codes, binary storage and registers, binary logic and integrated circuits.

UNIT–II
Definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, digital logic gates, IC digital logic families, simplification of Boolean functions, two, three and four variable maps, sum of products and product of sums simplification, NAND and NOR implementation, nondegenarate forms, AND-OR-INVERT implementation, Don't-Care conditions, the tabulation method, determination and selection of prime-implicants.

UNIT–III
Combinational circuit, design procedure, adders, subtractors, code conversion, analysis procedure, multilevel NAND and NOR circuits, exclusive-or and equivalence functions, binary parallel adder, decimal adder, magnitude comparators, decoders, multiplexers, Read-Only memory, Programmable Logic Array.

UNIT–IV
Sequential circuit, flip-flops, analysis of clocked sequential circuits, flip-flop excitation tables, design procedure, design of counters, design with state equations.

UNIT–V
Registers, shift registers, ripple counters, synchronous counters, timing sequences, the memory unit, examples of random access memory, interregister transfer, arithmetic, logic, and shift micro-operations, conditional control statements, fixed-point binary data, overflow, arithmetic shifts, decimal data, floating-point data, non-numeric data, instruction codes, design of simple counter.

UNIT–VI
Processor organization, arithmetic logic unit, design of arithmetic logic unit, status register, design of shifter, processor unit, design of accumulator, control organization, microprogram control, control of processor unit, microprogram sequencer.

UNIT–VII
Computer system configuration, computer instructions, timing and control, execution of instructions, design of computer registers, design of control, computer console, microcomputer and microprocessor organization, instructions and addressing modes, stack, subroutines and interrupt, memory organization, input-output interface, direct memory access, overview of 8086 microprocessor.

References:

1. Morris Mano M., Digital logic and Computer Design, PHI .
2. Floyd and Jain, Digital Fundamentals, 8/e, Pearson Education.
3. Alan B Marcovitz, Introduction to logic and Computer Design, McGraw Hill.
4. Ronald J. Tocci, Digital Systems: Principals and Applications, 8/e, Pearson Education (2006).
5. Bartee J. C., Digital Computer Fundamentals, 6/e, TMH(2006).
6. Herbert Taub and Donald Schilling, Digital Integrated Electronics, McGraw Hill International Edition (1986).
7. Ramesh S. Gaonkar., Microprocessor Architecture, Programming, and Applications with the 8085, 4/e, Penram International Publishers(2005)

MSC1.2 : Mathematical Foundation for Computer Science

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Logic and Proofs: Propositions and logical operations, conditional statements, methods of proof, mathematical induction.

Unit II
Relations and Functions: Sets, sequences, matrices, mathematical structures, product sets and partitions, relations and digraphs, properties of relations, equivalence relations, operations on relations, transitive closure and Warshall's algorithm, functions, permutation functions .

Unit III
Combinatorics: permutations, combinations, Pigeonhole principle, recurrence relations, principle of Inclusion and Exclusion, generating functions.
Elements of Probability: Sample Space and Events, axioms of probability, conditional probability and independence. Addition, multiplication, total and Bayes' theorems.

Unit IV
Order Relations and Structures: Partially ordered set, lattices, finite Boolean algebras, functions on Boolean algebras, circuit designs.

Unit V
Graphs and Trees: Graphs, Euler paths and circuits, Hamiltonian paths and circuits, transport networks, matching problems; trees, labeled trees, tree searching, undirected trees, minimal spanning trees.

Unit VI
Languages and Finite State Machines: Languages and grammars, representation of special grammars and languages, finite state machines, semi groups, machines and languages, machines and regular languages, simplification of machines.

Unit VII
Groups and Coding: Semi groups, groups, coding of binary information and Error detection, decoding and error correction.

References:

1 Kolman ,Busby and Ros , Discrete Mathematical Structures , 4/e , Pearson Education.
2 Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4/e , Pearson Education (2005).
3 Purna Chandra Biswal, Discrete Mathematics and Graph Theory, PHI (2005).
4 Trembley J.P. and Manohar R., Discrete Mathematical Structure with Application to Computer Science. TMH.
5 Kishore. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, PHI.

MSC 1.3 : Data Structures using C++

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Object oriented programming, concepts of OOP, advantages of OOP, C++ program structures, classes, objects, friend functions, overloading member functions, constructors, destructors, operator overloading and type conversion, inheritance, types of inheritance, virtual base classes, abstract classes, pointers and inheritance, pointers and arrays, memory models, new and delete operators, binding, polymorphism and virtual functions, files, generic programming with templates, exceptional handling, strings, namespace, conversion functions, array based I/O, standard template library(STL).

Unit II
ADT, a model for an ADT, algorithm efficiency, list searches-sequential and binary search algorithm, linear list concepts, linked list concepts, linked list algorithms, processing a linked list, list applications, complex linked structures, C++ implementation, list ADT.

Unit III
Stack definition, basic stack operations, stack linked list implementation, stack applications, C++ implementation, stack ADT implementation, stack ADT-array implementation, queue definition, queue operations, queue linked list design, queue applications, C++ implementation, queue ADT-linked list and array implementation.

Unit IV
Recursion, designing recursive algorithms, case study-factorial, Fibonacci numbers, towers of Hanoi, C++ implementation.

Unit V
Trees, basic tree concepts, binary trees, binary tree traversal, expression trees, general trees, Huffman code, binary search trees, AVL trees, AVL tree implementation, AVL ADT, heap definition, heap algorithms, m-way search trees, B-trees, lexical search tree, B-Tree ADT.

Unit VI
Sorting concepts, insertion sort, selection sort, exchange sort, external sorts.

Unit VII
Graphs, graph operations, graph storage structures, grapgh algorithms, networks.

References:

1. Paul S. Wang, Standard C++ with Object Oriented Programming, Thomson Learning.
2. S. B. Lippman & J. Lajoie, C++ Primer, 3rd Edition, Addison Wesley.
3. B. A. Forouzon, R. F. Gilberge, Computer Science: A Structured Approach Using C++, 2/e, Thomson Learning (2004).
4. Herbert Schildt, C++-The Complete Reference, 2/e, TMH (2003).
5. R. F. Gilberg and B. A. Forouzan, Data Structures-A Pseudocode Approach with C++, Thomson Learning (2001).
6. Mark A. Weiss, Data Structures and Algorithm Analysis in C++, 2/e, Pearson Education (2005).
7. Langsam Yedidyah, Augenstein Moshe J., Tenenbaum Aaron M., Data Structures Using C and C++, 2/e,PHI/Pearson Education(2004).
8. Samanta. D., Classic Data Structures, PHI (2004).

MSC 1.4: Operating System Principles

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Introduction: Operating system structure, operations, overview of process management, memory management, storage management and protection and security; distributed systems, special purpose systems, computing environments.
System Structure: Operating system services under OS interface, system calls, system programs, operating system design and implementation, OS structure, virtual machines, system boot.

Unit II
Process Management and Process Coordination-Synchronization and deadlocks: Process scheduling, operations on processes, interprocess communication, communication in client server systems, multithreaded programming, scheduling criteria, scheduling algorithms, thread scheduling, algorithm service, Synchronization, the critical section problem, Peterson's solution, synchronization hardware, semaphores, classical problems of synchronization, monitors, synchronization examples,

atomic transaction, deadlock characterization, methods of handling deadlocks, deadlock prevention and avoidance, deadlock detection, recovery from deadlock.

Unit III
Memory Management: Swapping, contiguous memory allocation, paging, structure of page table, segmentation, example: the Intel Pentium, demand paging, copy-on-write, page replacement, allocation of frames, thrashing, memory-mapped files, allocating Kernel memory, examples.

Unit IV
Storage Management-File System and Secondary storage structure: File concept, access methods, directory structure, File-System mounting, file sharing, protection, file-system structure and implementation, directory implementation, allocation methods, free-space management, efficiency and performance, NFS, example-The WAFL file system, disk structure, disk attachment, disk scheduling, disk management, swap-space management, RAID structure, stable-storage implementation, tertiary storage structure.

Unit V
Protection and Security : Goals and principles of protection, domain of protection, access matrix, implementation of access matrix, access control, security problem, program threats, cryptrography as a security tool, user authentication.

Unit VI
Distributed Systems: Types of distributed OS, network structure, network topology, communication structures, and communication protocols.

Unit VII
Case Study- Linux Internals: Linux User and programmer Interface, File system, process management, interprocess communication, Memory management, Understanding shells, shell programming.

References:

1 Silberschartz A. and Galvin P., Operating System Concepts, 7/e, Addison Wesley.
2 Gary J. Nutt, Operating Systems, 2/e, Addition-Wesley.
3 I. M. Flyn, A. Mclver McHoes., Understanding Operating Systems, Thomson Learning.
4 D. M. Dhamdhare, Operating Systems, Tata Mc.Graw-Hill.
5 Deitel H.M., An Introduction to Operating Systems, Addison Wesley.
6 Jack Dent, Tony Gaddis, Guide to UNIX using Linux, Thomson Learning.
7 Nicholas Wells, Guide to Linux installation and Administration, Thomson Learning.

MSC 1.5: PROGRAMMING LABORATORY - I: OOPs and Data Structures

Practical: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

This laboratory course comprises of C++ programming and Data Structures

Section I: Lab. Assignment shall be carried out to include the following features of C++:

- Classes, objects, constructors and destructors, Function overloading, Operator overloading, Friend functions, Inheritance, virtual functions, abstract classes
- Exception Handling and Templates, STL

Section II: Data Structure algorithms studied in paper MSC1.3 shall be implemented using C++.

MSC 1.5: PROGRAMMING LABORATORY - II: OS and Digital Electronics Lab.

Practical: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Section-I: Lab. Assignment shall be carried out to include the following features of Linux/UNIX:

- Basic commands, File system commands
- Process management, interprocess communication
- Search and sort tools, AWK tool, Shell programming, make tool, tar utility
- System administration

Lab. Assignment shall be carried out to simulate the following OS features using c/c++

- cpu scheduling algorithms
- memory management scheme, demand paging scheme
- disk scheduling algorithms
- interprocess communication

Section-II: Lab. Assignment shall be carried out based on the paper MSC 1.1 including the following:

- TTL Characteristics
- TTL IC Gates
- Flip-Flops
- Counters
- Shift Registers
- Multiplexers
- Decoders
- Binary Adders: Half Adder, Full Adder
- P.C. Architecture Familiarization

M.Sc. II Semester

MCA 2.1: Design and Analysis of Algorithms

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Notion of algorithm, Fundamentals of algorithmic problem solving, problem types, linear data structures, graphs, trees, sets and dictionaries.

Unit II
Analysis of algorithm efficiency: Analysis frame-work, asymptotic notations and basic efficiency classes, mathematical analysis of nonrecursive and recursive algorithms, empirical analysis of algorithms.

Unit III
Brute Force and Divide and Conquer: selection sort and bubble sort, sequential search and brute-force string matching, closest-pair and convex -hull problems, exhaustive search, merge sort, quick sort, binary search, binary tree traversals, Strassen's matrix multiplication.

Unit IV
Decrease-and-Conquer and Transform-and-Conquer: Insertion sort, depth first search, topological sorting, presorting, Gaussian elimination, balanced search trees, heap sort, Horner's rule.

Unit V
Dynamic programming: Computing a Binomial coefficient, Warshall's and Floyd's algorithms, the Knapsack problem and memory functions.

Unit VI
Greedy technique-Prim's algorithm, Dijkstra'a algorithm, Huffman trees, P, NP, and NP-complete problems.

Unit VII
The Fast Fourier Transform and its Applications: The discrete Fourier transform and its inverse, the Fast Fourier transform algorithm, the FFT using bit operations, products of polynomials, the Schonhage-Strassen integer-multiplication algorithm.

References:

1. Anany Levitin, The Design and Analysis of Algorithms, Pearson Education.
2. Aho A.V, Hopcroft J.E and Ullman, J.D., The Design and Analysis of Computer Algorithms, Addison – Wesley.
3. Ellis, Horwitz, Sartaj Sahani and S. Rajashekaran, Computer Algorithms, Galgotia Publications Pvt. Ltd.
4. David Harel, Algorithmics: The Spirit of Computing, 2/e, Pearson Education.
5. Sara Baase, Computer Algorithms – An Introduction to Design and Analysis, Addison Wesley.

MSC 2.2 : Database Management System

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
Introduction: Database, characteristics of database approach, database users, advantages of database systems.

Unit II
Database System Concepts and Architecture: Data models, schemas and instances, the three schema architecture, data independence, DBMS languages and interfaces, DBMS component

modules and database system utilities, overview of Hierarchical, Network & Relational Data Base Management Systems, data modeling using Entity-Relationship Model.

Unit III
The Relational Data Model: Relational models concepts, relational constraints and relational database schemas, update operations and dealing with constraint violations, relational algebra, relational calculus, relational database design by ER to Relational mapping.

Unit IV
Relational Database Manipulation- SQL: Data definition in SQL, basic data retrieval, condition specification, arithmetic and aggregate operators, SQL join, set manipulation, categorization, updates, views, views and updates.

Unit V
Relational Database Design: Anomalies in a database-A consequence of bad design, functional dependencies, Normal forms based on primary keys, general definitions of second and third normal forms, Boyce-Codd normal form, relational database design algorithms, multivalued dependencies and fourth normal form, join dependencies and fifth normal form, other dependencies and normal forms, database design and implementation process.

Unit VI
System Implementation Techniques: Database System Architecture and the System Catalog, query processing and optimization, transaction processing concepts, concurrency control techniques, database recovery techniques, database security and authorization.

Unit VII
Advanced Database Concepts: Concepts of object-oriented databases, object database standards, languages and design, object relational database systems, Distributed database concept, types of distributed database systems, an overview of Client-Server architecture.

References:

1. Elmasri and Navathe, Fundamentals of Database Systems, 4/e, Pearson Education.
2. Bipin C. Desai,An Introduction to Database Systems, Galgotia Publications.
3. Date, C. J., An Introduction to Database Systems, Sixth Edition, Addison-Wesley.
4. Kroenke David M., Database Processing Fundamentals, Design, and Implementation, 8/e, PHI.
5. Shah, Database Systems Using Oracle-A simplified guide to SQL and PL/SQL, 2/e, PHI(2006).

MSC 2.3: System Software

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
Introduction: System software and machine architecture, traditional (CISC) machines, RISC machines.

Unit II
Assemblers: Basic assembler functions, machine dependent and machine independent assembler features, one-pass assemblers, multipass assemblers, MASM assembler, SPARC assembler.

Unit III
Loaders and Linkers: Basic loader functions, machine dependent and machine independent loader features, linkage editors, dynamic linking, bootstrap loaders.

Unit IV
Macro Processors: Basic macro processor functions, machine dependent and machine independent macro processor features, macro processor design options.

Unit V
Compilers: Basic compiler functions, machine-dependent compiler features, machine-independent compiler features, compiler design options the YACC compiler-compiler.

References:

1. Leland L. Black, System Software, 3/e, Pearson Education.
2. A.V. Aho, R. Semi, J.D. Ullman, Compilers - Principles, techniques and tools, Pearson Education.
3. D.M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw Hill.
4. Santanu Chattopadhyay, Compiler Design, PHI.

MSC 2.4: Data Communications and Computer Networks

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
Introduction: A brief history, applications, topology, standards and standards organizations, open systems and the OSI model, transmission media and codes, digital encoding schemes, analog signals, bit rate, digital-to-analog conversion, analog-to-digital conversion, modems, DSL.

Unit II
Making Connections: Communication carriers and devices, transmission modes, interface standards, multiplexing, digital carriers-T1 and SONET, contention protocols-aloha, CSMA, collision detection, collision avoidance, token parsing.

Unit III
Data Integrity and Security: Parity checks, checksums, CRC for error detection, hamming codes, encryption algorithm, key distribution and protection, public key encryption, transport layer security and server authorization, fire walls, viruses, threats and attacks.

Unit IV
Flow Control: Signaling, frame oriented control, go-back-n, selective repeat, protocol correctness.

Unit V
Loca Area Networks: Data link control, Ethernet-IEEE standard 802.3, fast Ethernet, gigabit Ethernet, token ring-IEEE 802.5, wireless networks.

Unit VI
Connecting networks-Layer 1 connections, Layer 2 connections, Layer 3 connections, Disjktra's algorithm, the Bellman-Ford algorithm, additional routing methods, congestion and deadlock.

Unit VII
Internet Protocol: Overview of TCP/IP, internet addressing, cluster addressing, obtaining an address, DNS, IP packets, fragmentation, IP routing, routers, multicast routers, resource reservation protocol, ICMP, IPV6, transport protocols, internet applications-Virtual terminal protocols, file transfers, SMTP, SNMP, socket programming, circuit technologies.

References

1. William A. Shay, Understanding Communications and Networks, 3/e, Thomson Learning.
2. William Stallings, Data and Computer Communications, 7/e, Pearson Education.
3. Behrouz A Forouzan, Data Communications and Networking, Tata McGraw-Hill.
4. Stevens et. al., Unix network programming-The sockets and networking API, Vol. 1/ 3/e, PHI.
5. Stevens et. al., Unix network programming-Interprocess Communication, Vol. 2, 2/e, PHI.
6. Ames Chellis Charles Perkins, Matthew Strebe, Networking Essentials:Study Guide MCSE, Second Edition, BPB Publications.

7. Douglas E. Comer, Internetworking with TCP/IP, Vol. I- Principles, Protocols, And Architecture, 3/e, PHI.
8. Stevens W.R., UNIX Network Programming, Vol. I and Vol II, 2/e, PHI.

MSC 2.5: PROGRAMMING LABORATORY -III: DBMS and Networks Lab.

Practical: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Section I: Lab. Assignment shall be carried out to include the following:

- SQL : Data definition in SQL, basic data retrieval, condition specification, arithmetic and aggregate operators, SQL join, set manipulation, categorization, updates, views, views and updates.
- Introduction to PL/SQL programming
- The student is to develop a logical and physical database design for the given problem.
- The logical design performs the following tasks: 1) Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints. 2) Identify the functional dependencies in each relation, 3) Normalize to the highest normal form possible.
- Perform physical design based above logical design using Oracle/MYSQL on Windows platform or MySQL/PostgreSQL on Linux platform
- Perform DML and DDL using all possible SQL commands and with the help any one host languages like C, C++, VB etc (ie embedded SQL)
- Perform DML and DLL using PL/SQL and PL/pgSQL for the above problems

Section-II: Lab. Assignment shall be carried out to implement the methods/techniques studied in the paper MSC 2.4 including the following:

- Identifying well known ports on a Remote System: By trying to listen to the various well known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.
- Writing a Chat application: i). One-One: By opening socket connection and displaying what is written by one party to the other. ii). Many-Many (Broad cast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.
- Data retrieval from a Remote database: At the remote database a server listens for client connections. This server accepts SQL queries from the client, executes it on the database and sends the response to the client.
- Mail Client: i). POP Client: Gives the server name , user name and password retrieve the mails and allow manipulation of mail box using POP commands. ii). SMTP Client: Gives the server name, send e-mail to the recipient using SMTP commands.
- Simulation of Telnet: Provide a user interface to contact well-known ports, so that client-server interaction can be seen by the user.
- Simple file transfer between two systems (without protocols): By opening socket connection to our server on one system and sending a file from one system to another.
- TFTP- Client: To develop a TFTP client for file transfer. (Unix Network programming-Stevens.)
- HTTP-Server: Develop a HTTP server to implement the following commands. GET, POST, HEAD, DELETE.

MSC 2.5: PROGRAMMING LABORATORY -IV: Visual Programming.

Practical: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Assignments related to VB/VB.NET programming language shall be carried out including the following features:

- Decision and iterative constructs
- Procedures, functions and exceptional handling
- Arrays, enumeration and structure
- Working with forms, GUI interface with windows forms and designing menus
- Objects and classes
- Overloading, inheritance, over riding
- Interfaces, namespaces and collections
- Events and delegates
- Multithreading and garbage collection
- Database programming
- Components and assemblies

M. Sc. III Semester

MSC 3.1: Software Engineering

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
Introduction: Product and Process: Evolving role of software, software characteristic and components, crisis, myths, software engineering – a layered technology, software process, linear sequential model, prototyping model, RAD model, evolutionary software process model.

Unit II
Software Process and Project Metrics: Measures, metric indicators, metric in process and the project domains, software measurement, metrics for software quality, software quality assurance.

Unit III
Analysis Concepts and Principles: Requirement analysis, communication techniques, analysis principles, software prototyping & Specification.

Unit IV
Analysis Modeling: Elements of the analysis model, data modeling, functional modeling, behavioral modeling, the mechanics of structured analysis, data dictionary, other classical analysis methods.

Unit V
Design Concepts and Principles: Software Design and software Engineering design process, Design principles, Design concepts, Design methods-Data design, Architectural design and process, Transform and Transaction mappings, Design post processing, Architectural design optimization, Interface design, Procedural design.

Unit VI
Software Testing Methods: Fundamentals, Test case design, White box testing, basis path testing, control structure testing, black box testing, Software testing strategies.

Unit VII
Object Oriented Software Engineering: Object oriented concepts, identifying the elements of an object model, Management of object-oriented software projects, Object-oriented analysis, design and testing.

References:

1. Roger S. Pressman, Software Engineering**,** 4/e, McGraw Hill.
2. I. Sommerville, Software Engineering, 6/e, Addison Wesley.
3. Shooman, Software Engineering, McGraw Hill .
4. B. Bruegge and A. H. Dutoit, Object Oriented Software Engineering, 2/e, Pearson Education.
5. T. C. Lethbridge and R. Laganiere, Object Oriented Software Engineering, Tat McGraw Hill.
6. Rambaugh J., Bluha M., Premerlani W., Eddly Fand Lorenen W., Object-Oriented Modeling and Design, PHI(2005).
7. Ghezzi, Etal, Fundamentals of Software Engineering, PHI.

MSC 3.2 : Modeling and Simulation

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
Introduction: Definition of system and simulation, Merits and demerits of simulation, Areas of application, Types of systems, various types of models to represent them, Discrete and Continuous systems, Steps in simulation study, Simulation Examples, Concepts of system Clocks, Event scheduling Vs Time advance algorithms.

Unit II
Elements of Probability: Sample Space and Events, axioms of probability, conditional probability and independence. Addition, multiplication, total and Bayes' theorems.

Unit III
Statistical Models in Simulation: Random variables, discrete distributions- Binomial, Poisson and Geometric distributions, continuous distributions-Normal and Exponential distributions, Inverse transformation techniques, convolution method, Acceptance-Rejection technique, queuing models, random number generation, test for random numbers.

Unit IV
Simulation Software: Selection of simulation software, simulation in C++, Simulation in GPSS, experimentation and statistical analysis tools, trends in simulation software.

Unit V
Input Modeling: Data collection, Distribution functions such as Normal, Poisson, exponential Distributions, Goodness of fit tests, Chi square test. Input models without data, multivariate and time series input models.

Unit VI
Verification and Validation of Models: Guidelines for verification of models, their calibration and Validation, Face validity, Validation of model assumptions, validating input-output transformations, Use of historical Data.

Unit VII
Evaluation of Simulation Experiments: Length of simulation run, static and dynamic stochastic simulations, elimination of transients, Auto correlated observations, variance reduction techniques.

References:

1. Jerry Banks. John S. Carson & Barry L. Nelson - Discrete Event system simulation, 3/e, Pearson Education.
2. Narsingh Deo, System simulations with Digital computers, PHI.
3. James A Payne Introduction to Simulation: Programming Techniques & Methods of Analysis McGraw Hill.
4. Geoffrey Gordon, System Simulation, 2/e, PHI.
5. Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, Theory of Modeling and Simulation, Academic Press
6. Kishore. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, PHI.
7. John E. Freund's, Mathematical Statistics, 7/e, PHI.

MSC 3.3 : Computer Graphics

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Introduction to computer graphics, programming in sample raster graphics package (SRGP), simple PHIGS, graphics hardware.

Unit II
Basic raster graphics algorithms for drawing 2D primitives,: scan converting lines, circles and ellipses. filling rectangles, polygons and ellipse arcs; pattern filling, thick primitives, clipping lines, circles, ellipse and polygons, antialiasing.

Unit III
Geometrical transformations: 2D transformations, homogeneous coordinates, matrix representation of 2D transformations, window-to-viewport transformation, 3D-transformations, composition of 2D and 3D transformations, viewing in 3D.

Unit IV
Representing curves and surfaces: Polygon meshes, parametric cubic curves, parametric bicubic surfaces, quadric surfaces.

Unit V
Solid modeling, achromatic and colored light, Dialog design and user interface software.

Unit V1
Visible surface determination: Functions of two variables, techniques for efficient visible surface algorithms, algorithms for visible line determination, the z-buffer algorithm, list-priority algorithm, scan-line algorithm, area-subdivision algorithm, algorithm for octrees and curved surfaces, visible surface ray tracing.

Unit VII
Illumination and Shading: Illumination models, shading models for polygons, surface detail, shadows, transparency.

References:

1. James D. Foley, Andres Van Dam, Steven K. Feiner, and John F. Hughies, Computer Graphics- Principles and Practice, 2/e, Pearson Education(2006).
2. Donald Hearn and M. Pauline Baker, Computer Graphics-C version, 2/e, Pearson Education.
3. Francis S. Hill Jr, Computer Graphics using open GL, 2/e. Pearson Education.
4. Roy A. Plastock and Zhigarg Xiang, Schaum's Outline of Computer Graphics, 2/e, TMH(2006).

MSC 3.4 : JAVA and Internet Programming

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
History and design features of JAVA, how java works, basics of JAVA, Applications and Applets, using the tools in JDK, javadoc, java, jdb etc.
JAVA Language- keywords, constants, variables and Data Types. Operators and Expressions, Decision making, branching and Looping, Labeled Loops Statement, Jump statements: Break, Continue, and Return. Arrays and Strings-Creating an Arrays, one and two Dimension Arrays, String Array, String and String Buffer Classes, Wrapper Classes.

Unit II
Classes, Objects and Methods Defining a class, adding variables and Methods, creating objects constructors, class inheritance, Basics types, using super, multi level hierarchy, abstract and final classes, object class, packages and interfaces, Access protection, Extending interfaces, packages. Exception Handling, Fundamentals exception types, uncaught exceptions, throws, throw, try -catch, final, built in exceptions, creating your own exceptions.

Unit III

Web Design **-**HTML and XML Languages, web browsers, coding for multiple screen resolutions, bandwidth concerns.

Web Site Design Principles- Design for the medium, design the whole website, design for the user, design for the screen, Planning the Site, planning site navigation, creating page templates, web typography- type design principles, controlling typography with the <FONT> element and Cascading Style Sheets, styling with CSS, graphics and Color, HTML frames, publishing and maintaining your websites.

Unit IV
Applet Programming - Creating and executing Java applets, inserting applets in a web page, Java security.

Unit V
Multithreading Fundamentals, Java Thread model : priorities, synchronization, messaging, thread class, Runnable interface, Interthread communication, suspending, resuming and stopping threads. Input/Output -Basics, Streams, Byte and Character streams, predefined streams, reading and writing from console and files .Using standard Java Packages (lang,util,io) Networking -Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Datagram programming.

Unit VI
AWT Classes, Event Handling and Swing classes, AWT Programming, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, Handling image, animation, sound and video. Event Handling-Different mechanism, the Delegation Event Model, Event Classes, Event Listener interfaces, Adapter and Inner Classes. Java Swing -Japplet, Icons and Labels, Text fields, Buttons, Combo Boxes, Tabbed and Scroll Panes, Trees, Tables.

Unit VII
JDBC -Setting the JDBC connectivity with a backend database. RMI -Two tier and Multitier Architecture, Object serialization, RMI Fundamentals, Programming using Java RMI Classes and interfaces . Servlets-Background, Life Cycle, Java Servlet Development kit, Servlet API, Handling HTTP Requests and responsing, Using Cookies, Session Tracking and security issues.

References :

1. Patrick Naughton And Herbert Schildt, Java The Complete Reference, TMH Publication .
2. Cay S. Horstmann and Gary Cornell, Core JAVA 2, Volume-I, 7/e, Pearson Education.
3. Cay S. Horstmann and Gary Cornell, Core JAVA 2, Volume-II, 7/e, Pearson Education (2006)
4. Bruce Eckel, Thinking in Java, 3/e, Prentice Hall(2006).
5. C. Muthu, Programming with JAVA, Thomson-Vijay Nicole.
6. Partrick Naughton, Herbert Schidlt, JAVA 2 -The Complete Reference, 4/e, Tata McGraw Hill (2001).
7. C. Xavier, World Wide Web Design with HTML, Tata McGraw Hill.
8. Joel Sklar,. Principles of Web Design, Web Warrior series, Thomson Learning.
9. Deitel, Deitel, and Nieto, Internet & World Wide Web-How to Program, PHI.

MSC 3.5: PROGRAMMING LABORATORY -V: Simulation and Graphics Lab.

Practical: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Section I: Lab. Assignment shall be carried out based on paper MSC 3.2 using C/C++ or GPSS package

Section II: Lab. assignments shall be carried out using C/C++ programming language to include the following features of computer graphics:

- scan converting lines, circles and ellipses
- filling rectangles, polygons and ellipse arcs
- line and curve attributes
- clipping lines, circles, ellipse and polygons
- 2D and 3D transformations
- spline representations, Bezier curve and surfaces; B-Spline curves and surfaces

MSC 3.6: PROGRAMMING LABORATORY -VI: JAVA and Internet Lab.

Practical: 4 hrs./week **Max. Marks: 80**

I. A. Marks: 20

Section-I Lab. assignments shall be carried out to include the following features of JAVA:

- Classes, objects, constructors and destructors
- Control structures
- packages
- Inheritance
- Event Handlers
- Exceptions and debugging
- Threads, multithreading
- Database connectivity
- File handling

Section-II: Lab. assignments shall be carried out to include the following features of Web designing:

- Applets
- HTML tags, Creating page templates, CSS, graphics and Color, HTML frames, DHTML

M.Sc. IV Semester

MSC 4.1: Object Oriented Analysis and Design Using UML

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Complexity: The Internet Complexity of software, the Structure of Complex Systems, Bringing order to Chaos On Designing Complex Systems.

Unit II
The Object Model: The Evolution of the Object Model, Elements of the Object Model, Applying the Object Model.

Unit III
Classes And Objects: The Nature of an Object, Relationships Among Objects, The Nature of a Class, Relationships Among Classes, The interplay of Classes and objects, Building Quality Classes and Objects.

Unit I
Classification: Importance of proper Classification, Identifying Classes and Objects, Key Abstraction And Mechanisms.

Unit IV
Notation: Elements of the Notation, Class Diagrams, State transition Diagrams, Object Diagrams, Interaction Diagrams, Module Diagrams, Process Diagrams, Applying the Notations.

Unit V
The Process: Principles, the Micro Development Process, the Macro Development Process.

Unit VI
Pragmatics: Management and Planning, Staffing, Release Management, Reuse, Quality Assurance and Metrics, Documentation, Tools, the Benefits and Risks of Object-Oriented Development.

Unit VII
Applications: Data Acquisition: Weather Monitoring Station; Client/Server Computing: Inventory Tracking.
Object Oriented Programming Languages: Smalltalk, Object Pascal, C++, Ada.

References:

1. Grady Booch, Object-Oriented Analysis and Design, 2/e, Pearson Education.
2. G. Booch, J. Rambaugh and I. Jacobson, The Unified Modeling Language User Guide, Pearson Education.
3. Simon Bennett, MCrobb Rayfarmar, Object Oriented Systems Analysis and Design Using UML, 2/e, Tata McGraw Hill.
4. Ali Bahrami, Object-oriented systems Development, McGrawHill.
5. Craig Larman, Applying UML and Patterns, Pearson Education.
6. Blaha and Rambaugh, Object Oriented Modeling and Design with UML, 2/e, PHI .
7. H. Erikson, M. Penker, B. Lyons, and D. Fado, UML 2 Tool Kit, Wiley Publishing.
8. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Pearson Education.
9. W. Richard Stevens, Using UML: Software Engineering with Objects and Components, 1/e, Pearson Education .

MSC 4.2: Optimization Techniques

Teaching: 4 hrs./week **Max. Marks: 80**
I.A. Marks: 20

Unit I
Introduction: Operations research model, solving the OR model, art of modeling, phases of OR study.

Unit II
Linear Programming: Two variable LP model, graphical LP solution, LP applications, LP model in equation form, the simplex method, M-method, two-phase method, special cases in simplex method, sensitivity analysis.

Unit III
Duality and Post-Optimal analysis: Definition of dual problem, primal-dual relationships, economic interpretation of duality, dual simplex method, generalized simplex algorithm, post-optimal analysis.

Unit IV
Transportation models: Definition of transportation model, the transportation algorithm, the assignment model-the Hungarian method; the transshipment model.

Unit V
Network Models: Scope and definition of Network models, minimal spanning tree algorithm, shortest-route problem, maximal flow model, CPM and PERT.

Unit V I
Advanced Linear Programming: Simplex method fundamentals, revised simplex method, bounded-variable algorithm, duality, parametric linear programming.

Unit VII
Decision Analysis and Game: Decision making under certainty, decision making under risk, decision under uncertainty, optimal solution of two-person zero-sum games, solution of mixed strategy games.

References:

1. Hamdy A. Taha, Operations Research, 8/e, Pearson Education.
2. Panneerselvam R., Operations Research, PHI.
3. Gillet B.E, Introduction to Operations Research, TMH.
4. Sharma J.K, Operations Research, Theory and Applications, McMillan India Ltd.

MSC 4.3: Elective-I

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

MSC4.3a: Bioinformatics

MSC4.3b: Artificial Intelligence

MSC4.3c: Neural Networks and Fuzzy Systems

MSC4.3d: Theory of Computation

MSC4.3e: Pattern Recognition

MSC4.3f: Digital Image Processing

MSC 4.4: Elective-II

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

MSC4.4a: Data Warehousing and Mining

MSC4.4b: Component Technologies

MSC4.4c: Advanced Computer Architecture

MSC4.4d: Mobile Communications

MSC4.4e: Principles of Management

MSC4.4f: Distributed Computing

MSC 4.5: PROGRAMMING LABORATORY -VII: OR and OOAD Lab.

Practical: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Lab. Assignments shall be carried out based on paper MSC4.1 and MSC4.2. using C/C++.
The student is expected to take up about mini-project and model them and produce Use Cases, Analysis Documents - both static & dynamic aspects, Sequence Diagrams and State-Charts, Database Design using Rational Products or other related packages. A sample collection of ideas is given:

Mini-Project - I: A Point-of-Sale (POS) System

A POS system is a computerized application used to record sales and handle payments; it is typically used in a retail store, it includes hardware components such as a computer and bar code scanner, and software to run the system. It interfaces to various service applications, such as a third-party tax calculator and inventory control. These systems must be relatively fault tolerant; that is, even if remote services are temporarily unavailable they must still be of capturing sales and handling at least cash payments. A POS system must support multiple and varied client-side terminals and interfaces such as browser, PDAs, touch-screens.

Mini-Project - II: Online Bookshop Example

Following the model of amazon.com or bn.com, design and implement an online bookstore.

Mini-Project - III: A Simulated Company

Simulate a small manufacturing company. The resulting application will enable the user to take out a loan, purchase a machine, and over a series of monthly production runs, follow the performance of their company.

Mini-Project - IV: A Multi-Threaded Airport Simulation

Simulate the operations in an airport. Your application should support multiple aircrafts using several runways and gates avoiding collisions/conflicts. Landing: an aircraft uses the runway, lands, and then taxis over to the terminal. Take-Off: an aircraft taxies to the runway and then takes off .

Mini-Project -V: An Automated Community Portal

Business in the 21st Century is above all BUSY. Distractions are everywhere. The current crop of "enterprise intranet portals" are often high noise and low value, despite the large capital expenditures it takes to stand them up. Email takes up 30 - 70% of an employee's time. Chat and Instant Messaging are either in the enterprise or just around the corner. Meanwhile, management is tasked with unforseen and unfunded leadership and change-agent roles as well as leadership development and succession management. What is needed is a simplified, repeatable process that enhances communications within an enterprise, while allowing management and peers to self-select future leaders and easily recognize high performance team members in a dynamic way.
Additionally, the system should function as a general-purpose confent management, business intelligence and peer-review application.
Glasscode's goal is to build that system. The software is released under a proprietary license, and will have the following features: Remote, unattended moderation of discussions However, it will have powerful discovery and business intelligence features, and be infinitely extendable, owing to a powerful API and adherence to Java platform standards. Encourages peer review and indicates for

management potential leaders, strong team players and reinforces enterprise and team goals seamlessly and with zero administration.

Mini-Project -VI: A Content Management System

The goal is to enable non-technical end users to easily publish, access, and share information over the web, while giving administrators and managers complete control over the presentation, style, security, and permissions.

Features:

? Robust Permissions System
? Templates for easy custom site designs
? Total control over the content
? Search engine friendly URL's
? Role based publishing system
? Versioning control
? Visitor profiling

Mini-Project-VII: An Auction Application

Several commerce models exist and are the basis for a number of companies like eBay.com, pricellne.com etc. Design and implement an auction application that provides auctioning services. It should clearly model the various auctioneers, the bidding process, auctioning etc.

Mini-Project -VIII: A Notes and File Management System

In the course of one's student years and professional career one produces a 1 lot of personal notes and documents. All these documents are usually kept on papers or individual files on the computer. Either way the bulk of the I information is often erased corrupted and eventually lost. The goal of this project is to build a distributed software application that addresses this "problem. The system will provide an interface to create, organize and manage I personal notes through the Internet for multiple users. The system will also allow users to collaborate by assigning permissions for multiple users to view and edit notes.

MSC 4.6: PROGRAMMING LABORATORY -VII: PROJECT WORK

Practical: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

All the candidates are required to submit a project report based on the work done by him/her during the project period of this Lab.

- The Guide shall be concerned teacher in the department.
- The Project topics should be based on syllabus or beyond.
- Each student shall carry out the project individually
- The details of the preparation of the project work is given in Annexure-I

Elective-I

MSC 4.3a: Elective-I: Bioinformatics

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Prerequisite: Basic knowledge of Computer Programming and Data Structures.

Unit I
Introduction- What is Bioinformatics, Goal, Scope, Applications, Limitations, and New Themes.
Basic Concepts of Molecular Biology - Life, Protein, Nucleic Acids, The Mechanism of Molecular Genetics, How the Genome Is Studied, The Human Genome Project.

Unit II
Introduction to Biological Databases- What is a Database? Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases

Unit III
Sequence Alignment: Pair wise Sequence Alignment, Database Similarity Searching, Multiple Sequence Alignment, Protein Motifs and Domain Prediction

Unit IV
Gene Prediction: Categories of Gene Prediction Programs, Gene Prediction in Prokaryotes, Gene Prediction in Eukaryotes.

Unit V
Molecular Phylogenetics: Phylogenetics Basics, Phylogenetic Tree Construction Methods and Programs.

Unit VI
Structural Bioinformatics: Protein Structure Basics, Protein Structure Visualization and Comparison and classification, Protein Secondary Structure Prediction

Unit VII
Genomics and Proteomics: Genome Mapping, Assembly, and Comparison and Proteomics

References

1. Xiong Jin, "*Essential Bioinformatics"*. Cambridge University Press, First South Asian edition, 2007
2. Setubal Joao Carlos, Joao Meidanis, Jooao Carlos Setubal *"Introduction to Computational Molecular Biology",* Thomson Learning, First Reprint, 2003
3. Mount W David, *"Bioinformatics Sequence and Genome Analysis".* CBS Publishers, First Indian Reprint, 2005
4. Krane E Dan and Michael L Raymer, "*Fundamental Concepts of Bioinformatics*". Pearson Education Inc., First Indian Reprint, 2003

MSC 4.4b: Elective-I: Artificial Intelligence

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
General issues and overview of AI, AI Techniques, AI problems, AI Techniques, importance and areas of AI, problem solving state space search-DLF, BFS Production system, problem characteristics.

Unit II
Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction- Cryptarithmetic and problems.

Unit III
Knowledge representation & mapping, approaches to knowledge to representation, issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Resolution and natural deduction Representing knowledge using rules, Procedural v/s Declarative knowledge, Logic programming, Forward v/s Backward chaining, Matching & control knowledge.

Unit IV
AI programming language: Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using "trees" and "lists", use of cut, I/O of characters and structures.

Unit V
Symbolic reasoning under uncertainty: Introduction to monotonic reasoning, Logics for Nonmonotonic reasoning, implementation issues, implementation: DFS & BFS.

Unit VI
Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts, CYC Natural languages and NLP, Syntactic processing parsing techniques, semantic analysis case grammar, augmented transition net, discourse & pragmatic processing, translation.

Unit VII
Definition and characteristics of Expert System, representing and using domain knowledge, Expert system shells Knowledge Engineering, knowledge acquisition, expert system life cycle & expert system tools, MYCIN & DENDRAL examples of expert system.

References:

1. Rich & Knight , Artificial Intelligence, TMH
2. Cloksin & Mellish , Programming In Prolog, Narosa Publishing House.
3. Nillson Harcourt, Principles Of Artificial Intelligence, Asia & Morgan.
4. Janakiraman, Sarukesi & Gopal Krishnan Macmillan. Foundation Of Artificial Intelligence & Expert System, MacMillan

MSC 4.3c: Elective-I: Neural Networks and Fuzzy Systems

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit–I
Introduction: Introduction to Neural networks and fuzzy logic, basic concepts of neural networks, human brain, model of artificial neuron, neural network architectures, characteristics of neural networks, learning methods.

Unit–II
Backpropogation Networks: Architecture, backpropogation learning, applications, tuning of backpropogation neural networks, parameters in BPN, variation of standard backpropogation algorithm, research directions.

Unit III
Associative Memory: Autocorrelators, heterocorrelators, Wnag et. al.'s multiple training encoding strategy, exponential BAM, associative memory for real-coded patter pairs, applications.

Unit IV
Adaptive Resonance Theory: Classical ART networks, simplified ART architecture, ART1, ART2, applications.

Unit V
Fuzzy Set Theory: Crisp sets, Fuzzy sets, Crisp relations, Fuzzy relations.

Unit VI
Fuzzy Systems: Crisp logic, predicate logic, fuzzy logic, fuzzy rule based systems, defuzzification methods, applications.

Unit VII
Hybrid Systems : Neuro-fuzzy hybrids, fuzzy-backpropogation networks, LR-type fuzzy numbers, fuzzy neuron, fuzzy BP architecture, learning in fuzzy BP, inference by fuzzy BP, applications, fuzzy ARTMAP, simplified ARTMAP, applications, fuzzy associative memories-single association FAM, fuzzy Hebb FAMs, FAM involving a rule base, FAM rules with multiple antecedents/consequents, applications.

References:

1. S. Rajashekaran, G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logics and Genetic Algorithms, PHI.
2. Stamatios V. Kartalopoulos, Understanding Neural Networks And Fuzzy Logic—Basic Concepts And Applications, PHI (20056.
3. Bart Kosko, Neural networks and fuzzy systems - A dynamical systems approach to machine intelligence, PHI.

MSC 4.3d: Elective-I: Theory of Computation

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit–I
Introduction: Sets, relations and functions; strings and their properties; automation, transition systems, nondeterministic finite state machines, equivalence of DFA and NDFA, Mealy and Moore Models.

Unit II
Formal Languages and Regular Grammars: Chomsky classification of languages, languages and their relation, operations on languages, languages and automata, regular expressions, finite automata and regular expressions, pumping lemma, regular sets and regular grammars.

Unit III
Context-free languages: Context-free languages and derivation trees, ambiguity in context-free grammars, normal forms for context-free grammars, pumping lemma, decision algorithms, push down automata, pushdown automata and context-free languages, parsing and pushdown automata.

Unit IV
Turing Machines and Linear Bounded Automata: Turing machine model, representation of Turing machines, language acceptability, design of Turing machines, the model of linear bounded automation, Turing machines and type 0 grammars, linear bounded automata and languages, halting problem of completeness, NP-completeness.

Unit V
LR(k) grammars, computability**-** primitive recursive functions, recursive functions, partial recursive functions and Turing machines.

References:

1. K.L.P. Mishra and N. Chandrasekaran, Theory of Computer Science, 2/e, PHI.
2. Michael Sipser, Introduction to the Theory of Computation, Thomson Learning.
3. J P Hoperoft, J D Ullman, Introduction to Automata, Languages and Computation, Narosa Publications.
4. John C. Martin, Introduction to Languages and the Theory of Computation,2nd Edition, McGraw Hill.

MSC 4.3e: Elective-I: Pattern Recognition

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Introduction: Application of Pattern Recognition, statistical Decision Theory, Image Processing and Analysis.

Unit II
Probability: Introduction, Probability of Events, Random Variables, Joint Distribution and Densities, Moments of Random variables, Estimation of Parameters from samples, Minimum Risk Estimations.

Unit III
Statistical Decision Making: Introduction, Baye's Theorem, Multiple Features, Conditionally Independent Features, Decision Boundaries,- Estimation of Error rates, Characteristic centers, Estimating the Composition of Populations.

Unit IV
Non Parametric Decision Making: Introduction, Histograms, Kernel and Windows Estimators, Nearest Neighbour Classification Techniques, Adaptive Decision Boundaries, Adaptive Discriminant Functions, Minimum Squared.

Unit V
Clustering: Introduction, Hierarchical Clustering, Partitional Clustering.

Unit VI
Artificial Neural Networks: Introduction, Nets without Hidden layers, Nets with Hidden layers,The Back – Propagation Algorithm, Hopfied Nets – An Application: Classifying Sex from facial images.

Unit VII
Processing Of Wave Form And Images: Introduction, Gray level Scaling, Transformations, Equalizations, Geometric Image Scaling and Interpolations, Logarithmic Gray Level Scaling ,The Statistical Significance of Image Features.

References:

1. Earl Gose, Richard Johnsonbaugh and Steve Jost, Pattern Recognition and Image Analysis, PHI, 1997.
2. Fu.K.S., Syntactic Methods in Pattern Recognition, Academic Press, 1974.
3. Tray Y Young and Thomas W Calvert, Classification, Estimation and Pattern Recognition, American Elservier Publication Company Inc., 1994.
4. Duda R.O. and Hart P.E., Pattern Classification and Scene Analysis, John Wiley.

MSC 4.4f: Elective-I: Digital Image Processing

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Digital Image Fundamentals: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

Unit II
Image Enhancement in the Spatial Domain: Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Unit III
Image Enhancement in the Frequency Domain: Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering.

Unit IV
Image Restoration: A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

Unit V
Image Compression: Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards.

Unit VI
Image Segmentation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

Unit VII
Representation and Description: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.
Object Recognition: Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

References:

1. R.C. Gonzalez and R. E. Words, Digital Image Processing, 2/e, Pearson Education.
2. Anil K .Jain, Fundamentals of Digital Image Processing, PHI.
3. W.K. Pratt, Digital Image Processing,Wiley Eastern.
4. Chanda & Mujumder, Digital Image Processing and Analysis, PHI.
5. Millan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, Thomson Learning-Vikas Publishing House .
6. Joshi, Digital Image Processing – An algorithmic approach, PHI.

Elective-II

MSC 4.3a: Elective-II: Data Warehousing and Mining

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit – I
Need for strategic information, Decision support system, Knowledge discovery & decision making, need for data warehouse, definitions of Data warehousing and data mining, common characteristics of Data warehouse, Data Marts, Metadata, Operational versus analytical databases, trends and planning of Data warehousing.

Unit – II
Defining business requirements, Data modeling strategy, Fact tables, dimensions, Star schema and other schemas, Multi dimensional data models, Data Cube presentation of fact tables, using the Data warehouse, Designing tools for Data warehouse, OLAP models and operations.

Unit – III
Architectural components, Infrastructure: Operational & Physical, Extraction, Transformation and Loading, Components of an Oracle Data warehouse, Data Transformation Functions, DBA responsibilities, Capacity Planning.

Unit – IV
Implementation of Data warehouse, Physical design: steps, considerations, physical storage, indexing, Performance Optimization, Data warehouse deployment activities, Data security, backup and recovery concepts, Data warehouse Maintenance.

Unit – V
Basics of data mining, related concepts, Data mining techniques, Data Mining Algorithms -- Classification, Clustering, and Association rules, Knowledge Discovery in databases(KDD) Process, Introduction to Web Mining

References:

1. Paulraj Ponnian, Data Warehousing Fundamentals, John Wiley.
2. Rajeev Parida, Principles and Implementation of Data Ware housing, Fire Wall Media, Lakshmi Publications.
3. W.H.Inmon, Building the Data Warehouse , John Wiley & Sons.
4. Sam Anahory and Dennis Murray, Data Warehousing in the Real World, Pearson Education.
5. Margaret H. Dunham, Data Mining-Introductory and Advanced Topics, Pearson Education.
6. Amitesh Sinha, Data Warehousing, Thomson Learning .
7. IBM, An Introduction to Building the Data Warehouse, PHI.
8. Alex Berson & Stephon J. Smith, Data warehousing, Data mining and OLAP by, Tata McGraw Hill.
9. Sam Anahory & Dennis Murray, Data Warehousing in the Real World – A Practical Guide for Building Decision Support Systems, Pearson Education.

MSC 4.4b: Elective-II: Component Technologies

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Pre-requisites: C++, Java Programming, OOAD

Unit I

Introduction to object oriented systems: Preview of Object-orientation, Concept of distributed object systems, Reasons to distribute for centralized objects. Mapping objects to locations. Object oriented system architecture, client-server system architecture, multi tier system architectures. Design of object oriented system architecture and component technology compound document.

Introduction to distributed objects: Computing standards, OMG, Overview of CORBA, Overview of COM/DCOM and of an open doc, Overview of Object Web, Overview of java, Enterprise java beans.

Unit II

Component Object Model (COM) introduction: Com as better C++ software distribution, Dynamic linking, Separating interface and COM implementation, Run time polymorphism, Introduction to DCOM.

Unit III

Interface in COM-DCOM: Introduction to interfaces, Interface definition language (IDL), Interface and IDL, Using COM interface pointers, Optimizing query interface, Code sharing and reuse.

Classes and Objects in COM-DCOM: Introduction, Classes and servers, Optimizations, Classes and IDL, Class emulation, Query interface types and properties, Object services and dynamic composition.

Unit IV

Apartments: Cross-apartments access, lifecycle management.

Unit V

CORBA: Introduction and concepts, distributed objects in CORBA, CORBA components, architectural features, method invocations static and dynamic: IDL (Interface Definition Language) models and interfaces. Structure of CORBA IDL, CORBA's self-describing data; CORBA interface repository.

Unit VI

CORBA Services: Services for object naming, Object lifecycle, Event, Transaction service features, concurrency control services, persistent object service and CORBA security service.

Unit VII

Enterprise Java Beans

JAVA Interface: JNI interface with C++, VC++.

Object Web: web technologies interfacing with distributed objects over client server and distribute architecture

References:

1. Booch, Jacobson, Rambug, Essential COM, Pearson Education.
2. Don Box, Essential COM, Pearson Education.
3. Jason Pritchard, COM and CORBA side by side, Pearson Education
4. Tom Valesky, Enterprise Java Beans, Pearson Education.

MSC 4.4c: Elective-II: Advanced Computer Architecture

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I

Pipe Line And Vector Processing: Introduction , Linear pipepline , Classification, Reservation tables, Introduction prefetch and branch handling, Data Buffering and Busing structure, Internal forwarding and register tagging, Hazard detection , Characteristics of Vector processing.

Unit II

Array Processing: SIMD Array processors, SIMD Interconnection networks , Static and dynamic - Mesh connection, Cube connection, Barrel shifter and data manipulation, parallel algorithm for SIMD matrix multiplication.

Unit III

Multiprocessor Architecture: Loosely coupled, tightly coupled multiprocessor configurations, Interconnection networks, Interleaved memory organization, Multiprocessor operating systems, Software requirements for multiprocessors.

Unit IV

Multiprocessing Control and Algorithms: Inter process communication mechanism and process synchronization, system deadlock problem, Multiprocessor scheduling strategy, parallel algorithms for multiprocessors.

Unit V

Memory Organization: Introduction, Characteristics of memory systems, Memory hierarchy, Cache memories, Mapping schemes, Virtual memory concepts, paging and segmentation systems, placement policies.

References:

1. Kai Hwang and Feye A. Briggs, Computer Architecture and parallel processing, McGraw Hill.
2. Dezso Sima, Terence Fountain and Peter Kacsuk, Advanced Computer Architecture-A Design Space Approach, Pearson Education (2005)
3. Kain, Advanced Computer Architecture-A Systems Design Approach, PHI(2006).
4. Kai Hwang, Advanced Computer Architecture, McGraw Hill (2000).

MSC 4.4d: Elective-II: Mobile Communications

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Objective: Recent developments in portable devices and high-bandwidth, ubiquitous wireless networks has made mobile computing a reality. Indeed, it is widely predicted that within the next few years' access to Internet services will be primarily from wireless devices, with desktop browsing the exception. Such predictions are based on the huge growth in the wireless phone market and the success of wireless data services. This course will help in understanding fundamental concepts, current developments in mobile communication systems and wireless computer networks.

Unit I

Introduction: History of wireless communication, a simplified reference model, applications, frequencies for radio transmission, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular systems.

Unit II

Medium access control: SDMA, FDMA, TDMA, CDMA

Unit III
Telecommunications ans satellite systems: GSM, DELT, TETRA, UMTS, and IMT-2000, basics of satellite systems, routing, localization, handover, examples,

Unit IV
Broadcast Systems: Cyclical repition of data, digital audio broadcasting, digital video broadcasting, convergence of broadcasting and mobile communications.

Unit V
Wireless Lan: infrared vs radio transmission, infrastructure and adhoc network, IEEE 802.11 HIPER LAN, Blue Tooth.

Unit VI
Mobile Network Layer and Transport Layer: Mobile IP, dynamic host configurartion protocol, mobile adhoc networks, traditional TCP, classical TCP improvements, TCP over 2.5/3G wireless networks.

Unit VII
Support for mobility: File systems, world wide web, wireless application protocol(version 1.x), i-mode, SyncML, WAP 2.0.

References:

1. Johen Schiller, Mobile Communications, 2/e, Pearson Education.
2. Stuber G.L., Principles of Mobile Communications, Academic Press.
3. Rappapert T.S., Wireless Communication Principles & Practices, Prentice Hall.

MSC 4.4e: Elective-II: Principles of Management

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
Management basics – What is management, the history of management, types of manager, manager qualities. Management responsibilities, management tasks and functions.

Unit II
The business environment – defining the organization, organization structure, the quality organization, organizational changes, Centralization and Decentralization, managing changes. Management obligations, social and professional responsibilities, government regulations.

Unit III
Strategy formulation – the elements of strategy, the strategy formulation process, alliances and acquisitions, strategy formulation tools and techniques, plan implementation.
Decision making – the nature of management decision, the decision making process, decision making techniques.
Information presentation and reporting - Principle, Type of Reports, Presentation on Modes, Function reporting system, Information and its uses, Characteristics of information, flow of information.

Unit IV
Management information system (MIS) and its uses, Computer based MIS – Advantages & Disadvantages. Brief introduction to project planning and management and its tools/techniques-Gantt chart, PERT/CPM. Human Resources management: Concepts & functions, Job analysis and role description.

Unit V
Management skills, Leadership and motivation – The nature of leadership, leadership theories, delegation, motivation and motivation theories, need of motivation, motivation techniques.
Team building – Defining and effective team, selecting team members, building teams, training and development.

Effective communication – The communication process, presentation skills. Tools and techniques.

Unit VI
Time management – The importance of time, characteristics of management tasks, determining time elements, time management techniques.

Unit VII
Entrepreneurship – Entrepreneur and its role, how to become an entrepreneur, essentials steps to become an entrepreneur, EDP training.

References :

1. S.K.Basandra, Computers Today, Galgotia Publications
2. Koontz H, Essentials Of Management, Tata McGraw Hill Publications.

MSC 4.4f: Elective-II: Embedded Systems

Teaching: 4 hrs./week **Max. Marks: 80**
I. A. Marks: 20

Unit I
An overview of embedded systems: Introduction to embedded systems, Categories and requirements of embedded systems, Challenges and issues related to embedded software development, Hardware/Software co-design, Introduction to IC technology, Introduction to design technology.

Unit II
Embedded Software development: Concepts of concurrency, processes, threads, mutual exclusion and inter-process communication, Models and languages for embedded software, Synchronous approach to embedded system design, Scheduling paradigms, Scheduling algorithms, Introduction to RTOS, Basic design using RTOS

Unit III
Embedded C Language: Real time methods, Mixing C and Assembly, Standard I/O functions, Preprocessor directives, Study of C compilers and IDE, Programming the target device

Unit IV
Hardware for embedded systems: Various interface standards, Various methods of interfacing, Parallel I/O interface, Blind counting synchronization and Gadfly Busy waiting, Parallel port interfacing with switches, keypads and display units, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above concepts using C language

Unit V
Study of ATMEL RISC Processor: Architecture, Memory, Reset and interrupt , functions, Parallel I/O ports, Timers/Counters, Serial communication, Analog interfaces, Implementation of above concepts using C language, Implementation of above concepts using C language.

Unit VI
Case studies and Applications of embedded systems: Applications to: Communication, Networking, Database, Process Control, Case Studies of: Digital Camera, Network Router, RTLinux.

References:

1. Raj Kamal, Embedded Systems, Tata McGraw Hill.
2. David E. Simon, An Embedded Software Primer, Pearson Education.
3. Muhammad Ali Mazidi and Janice Gillispie Mazidi, The 8051Microcontroller and Embedded Systems, Pearson Education.
4. Frank Vahid, Tony Givargis, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley.

5. Craig Hollabaugh, Embedded Linux, Pearson Education
6. Daniel Lewis, Fundamentals of Embedded Software, Pearson Education.
7. Barnett, Cox, O'Cull, Embedded C Programming and the Atmel AVR , Thomson Learning
8. Myke Predko, Programming and Customizing the 8051 Microcontroller, TMH

ANNEXURE-I

SUMMARY/ABSTRACT- All students must submit a summary/abstract separately with the project report. Summary, 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 must adhere to the guidelines and should include the following:

- Name / Title of the Project
- Statement about the Problem
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT- This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DESCRIPTION: The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS: The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final project Report:

Good quality white executive bond paper A4 size should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

Page Specification :(Written paper and source code)

Left margin - 3.0 cms
Right margin- 2.0 cms
Top margin 2.54 cms
Bottom margin 2.54 cms

Page numbers - All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.

Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing.

Coding Font size : 10, Courier New, Normal

Submission of Project Report to University: The student will submit his/her project report in the prescribed format. The Project Report should include:

- One copy of the summary/abstract.
- Three hard Copies of the Project Report
- Soft copy of project on Floppy/CD in a thick envelope pasted inside of the back cover of the project report.
- The Project Report may be about 75 pages (excluding coding).

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION OF THE PROJECT

1. Cover Page as per format
2. Acknowledgement
3. Certificate of the project guide as at Annexure
4. Synopsis of the Project
5. Main Report
   - Objective & Scope of the Project
   - Theoretical Background
   - Definition of Problem
   - System Analysis & Design vis-a-vis User Requirements
   - System Planning (PERT Chart)
   - Methodology adopted, System Implementation & Details of Hardware & Software used
   - System Maintenance & Evaluation
   - Cost and benefit Analysis
   - Detailed Life Cycle of the Project
     - o ERD, DFD
     - o Input and Output Screen Design
     - o Process involved
     - o Methodology used for testing:
     - o Test Report, Printout of the Reports, Printout of the Code Sheet
   - User/Operational Manual - including security aspects, access rights, back up, controls, etc.
6. Data Dictionary (This should give a catalogue of the data elements used in the system / sub system developed. The following are the details required. Write NA if NOT applicable : Data Name , Aliases, if any Length (Size) Type, Numeric, Alpha, Binary etc.
7. List of abbreviations, Figures, Tables
8. References Bibliography Website
9. Soft copy of the project on CD/Floppy

GUIDE CERTIFICATE

Guide Name:

Full Address:

CERTIFICATE

This is to certify that this project entitled " xxxxxx xxxxx xxxxx xxxxxxxx xxx" submitted in partial fulfillment of the degree of Master of Science (Computer Science) to the Department of Computer Science, Gulbarga University, Gulbarga through "xxxxxx xxxxx" (College/Department Name), done by Mr./Ms._____, Roll No. _____ is an authentic work carried out by him/her under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the Guide

COVER PAGE

Title of the thesis/report
(Times New Roman, Italic, Font size = 24)

Submitted in partial fulfillment of the requirements
for the award of the degree of M.Sc in Computer Science
(Bookman Old Style, 16 point, centre)

Submitted by:
(Student name)
Roll No.:

Submitted to
GULBARGA UNIVERSITY, GULBARGA
College/Department
College Name and City

DECLARATION

This is to certify that the dissertation/project report entitled "_____" is done by me and is an authentic work carried out for the partial fulfillment of the requirements for the award of the degree of M.Sc in Computer Science under the guidance of _____. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student
Name of the Student
Reg. No.

ANNEXURE-II

Theory Question Paper Pattern

Maximum marks for the theory paper is 80.
There shall be 8 questions as detailed below:

Section-A

- Question No.1 is compulsory and consists of 10 questions of 2 marks each. The students are expected to write short answers.

Section-B

- Question No.2 to Question No.8 are of 12 marks each. Each question may have two to three sub questions. The students are expected to attempt any five questions.

Practical Question Paper Pattern

Maximum marks for the practical/project work is 80.

- There shall be two assignments in the question paper for each practical examination. The student is expected to write flowchart/OO diagram, algorithm and program for the assignment. Implementation of the both the programs shall be carried out.
- In case of project, the student is expected to give PPT presentation along with the demo of the application he/she has developed during the project work.
- There shall be viva-voce for practical/project work.