VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY, BELLARY

Post Graduate Studies in Computer Science

(Approved in the BOS meeting held on 12-04-2013)

M.Sc. Comp. Sc. I to IV SEM Syllabus

(CBCS REGULATION)

	Paper Code	Subject	Marks Allotment		Total	Credit
Semester –I			Exam	CA		
Hard Core	MSC 1.1	Digital Logic and Computer Design	70	30	100	4
	MSC 1.2	Mathematical Foundation for Computer Science	70	30	100	4
	MSC 1.3	Data Structures using C++	70	30	100	4
Soft Core	MSC 1.4	Operating System principles	70	30	100	4
Practical-I	MSC 1.5	Digital Logic and Linux/Unix Lab	70	30	100	2
Practical-II	MSC 1.6	Data Structure using C++ Lab	70	30	100	2

	Paper Code	Subject	Marks Allotment		Total	Credit
Semester –II			Exam	CA		
Hard Core	MSC 2.1	Design & Analysis of Algorithm	70	30	100	4
	MSC 2.2	Database Management System	70	30	100	4
Soft Core	MSC 2.3	System Software	70	30	100	4
Open Elective	MSC 2.4	Introduction to Computers & Programming in C	35	15	50	2
Practical-I	MSC 2.5	Algorithms and DBMS Lab	70	30	100	2
Practical-II	MSC 2.6	Visual Programming Lab	70	30	100	2

	Paper Code	Subject	Marks Allotment		Total	Credit
Semester –III			Exam	CA		
Hard Core	MSC 3.1	Programming in JAVA	70	30	100	4
	MSC 3.2	Data Communications & Computer Networks	70	30	100	4
Soft Core	MSC 3.3	Computer Graphics	70	30	100	4
Open Elective	MSC 3.4	Information Technology	35	15	50	2
Practical-I	MSC 3.5	Java Prog. and Computer Networks	70	30	100	2
Practical-II	MSC 3.6	Computer Graphics Lab	70	30	100	2

	Paper Code	Subject	Marks Allotment		Total	Credit
Semester –IV			Exam	CA		
Hard Core	MSC 4.1	Internetworking & Web Design	70	30	100	4
	MSC 4.2	Software Engineering	70	30	100	4
Soft Core – Elective-I	MSC 4.3	a) Bioinformatics b) Artificial Intelligence c) Neural Networks and Fuzzy Systems d) Theory of Computation e) Pattern Recognition	70	30	100	4
Soft Core – Elective-II	MSC 4.4	a) Data Warehousing and Mining b) Embedded Systems c) Advanced Computer Architecture d) Mobile Communications e) Digital Image Processing	70	30	100	4
Practical-I	MSC 4.5	SC Lab and Web Design Lab	70	30	100	2
Practical-II	MSC 4.6	Project Work	70	30	100	2

M. Sc. I Semester

MSC1.1 HC: Digital Logic and Computer Design

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessments. 30

UNIT–I

8Hrs

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

10Hrs

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, non degenerate forms, AND-OR-INVERT implementation, Don't-Care conditions, the tabulation method, determination and selection of prime-implicants.

UNIT–III

8Hrs

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

8Hrs

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

UNIT–V

10Hrs

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 8Hrs

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.

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 .
5. Bartee J. C., Digital Computer Fundamentals, 6/e, TMH.
6. Herbert Taub and Donald Schilling, Digital Integrated Electronics, McGraw Hill International Edition .
7. Ramesh S. Gaonkar., Microprocessor Architecture, Programming, and Applications with the 7085, 4/e, Penram International Publishers.

MSC1.2 HC: Mathematical Foundation for Computer Science

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

Unit I 10Hrs

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 II 10Hrs

Combinatorics: permutations, combinations, Pigeonhole principle, recurrence relations, principle of Inclusion and Exclusion, generating functions.

Unit III 10Hrs

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

Unit IV 10Hrs

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 V 12Hrs

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.
3. Puma Chandra Biswal, Discrete Mathematics and Graph Theory, PHI.
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 1.3HC: Data Structures using C++

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment: 30

Unit I 6Hrs

Object oriented programming, concepts of OOP, advantages of OOP, 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 12Hrs

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 6Hrs

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

Unit V 12Hrs

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 8Hrs

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

Unit VII 8Hrs

Graphs, graph operations, graph storage structures, graph 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++, Thomson Learning.
4. Herbert Schildt, C++-The Complete Reference, TMH.
5. R. F. Gilberg and B. A. Forouzan, Data Structures-A Pseudocode Approach with C++, Thomson Learning.
6. Mark A. Weiss, Data Structures and Algorithm Analysis in C++, 2/e, Pearson Education.
7. Langsam Yedidyah, Augenstein Moshe J., Tenenbaum Aaron M., Data Structures Using C and C++, 2/e,PHI/Pearson Education.
8. Samanta. D., Classic Data Structures, PHI.

MSC 1.4SC: Operating System Principles

Credits: 04

Teaching: 4 hrs./week
Max Marks: 70 Cont. Assessment. 30

Unit I 10Hrs

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 12Hrs

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 8Hrs

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 12Hrs

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
10Hrs

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

Reference:

1 Silberschartz A. and Galvin P., Operating System Concepts, 7/e, Addison Wesley.

2 Gary J. Nutt, Operating Systems, 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: Practical – I: Digital Logic and Linux/Unix Lab.

Credits: 02

Practical: 4 hrs./week
Max Marks: 70 Cont. Assessment. 30

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

- Realization of NOT, OR, AND, XOR, XNOR gates using universal gates
- Gray to Binary conversion & vice-versa.
- Code conversion between BCD and EXCESS-3
- ODD and even parity generation and checking.
- 4-bit comparator circuit
- Design of combinational circuit to drive seven-segment display
- Design of combinational circuits using multiplexer
- Adder/Subtractor circuits using Full-Adder using IC and/ or logic gates.
- BCD Adder circuit using IC and/ or logic gates
- Realization of RS, JK, and D flip flops using Universal logic gates
- Realization of Asynchronous up/down counter
- Realization of Synchronous Mod-N counter

Section II : 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

MSC 1.6: Practical – II: C++ and Data Structures Lab.

Practical: 4 hrs./week **Credits: 02**

Max Marks: 70 Cont. Assessments. 30

Section I: Data Structure algorithms studied in paper MSC1.3 shall be implemented using C++. Assignments should include but not limited to-

- Linked lists: inserting, deleting, inverting a linked list
- Stacks and Queues: adding, deleting elements
- Circular Queue: Adding & deleting elements
- Evaluation of expressions
- Polynomial addition, Polynomial multiplication
- Sparse Matrices: Multiplication, addition.
- Recursive and Nonrecursive traversal of Trees
- Threaded binary tree traversal. AVL tree implementation
- Application of Trees.
- Application of sorting and searching algorithms

M.Sc. II Semester

MSC 2.1HC: Design and Analysis of Algorithms

Credits: 04

Teaching: 4 hrs./week
Max Marks: 70 Cont. Assessment. 30

Unit I 5Hrs

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

Unit II 10Hrs

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

Unit III 9Hrs

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 10Hrs

Decrease-and-Conquer and Transform-and-Conquer: Depth first search, Breadth First Search, topological sorting, balanced search trees, heap sort, Horner's rule.

Unit V 5Hrs

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

Unit VI 5Hrs

Greedy technique-Prim's algorithm, Dijkstra'a algorithm, Huffman trees.

Credits: 04

5Hrs

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10Hrs

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algorithms,

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Hrs

Unit VII 8Hrs

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, Pearson Education.
5. Sara Baase, Computer Algorithms – An Introduction to Design and Analysis, Addison Wesley.

MSC 2.2HC : Database Management System

Credits: 04

Teaching: 4 hrs./week
Max Marks: 70 Cont. Assessment. 30

Unit I 4Hrs

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

Unit II 8Hrs

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 Relational Data Base Management Systems, data modeling using Entity-Relationship Model.

Unit III 10Hrs

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 8Hrs

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 10Hrs

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.

Unit VI 12Hrs

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.

References:

1. Henry F. Korth and Silberschatz Abraham, Database System Concepts, Mc.Graw Hill
2. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education.
3. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications.
4. Date, C. J., An Introduction to Database Systems, Addison-Wesley.
5. Kroenke David M., Database Processing Fundamentals, Design, and Implementation, PHI.
6. Shah, Database Systems Using Oracle-A simplified guide to SQL and PL/SQL, PHI.

MSC 2.3SC: System Software

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment. 30

Unit I **10Hrs**

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

Unit II **10Hrs**

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

Unit III **10Hrs**

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

Unit IV **10Hrs**

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

Unit V **12Hrs**

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, 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 OE: Introduction to Computers and Programming in C

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment.30

UNIT I **5Hrs**

Introduction to computers, Basic structure of computer, problem solving steps, Algorithm and flowchart.

UNITII **10Hrs**

C-essentials, basic structure of a C-program, Character set, constants and varaibles, datatypes, declaration of variables,Assignment statement, Symbolic constants,arithmetic operators, Assignment operators, Increment and decrement operator,Conditional operator, Arithmetic expressions-evalution, Input/Output operations: Reading/Writing a character, Formatted input/output.

UNIT III **11Hrs**

Decision making and branching: IF statement, If ELSE, nested if...else statement, Else if ladder, Switch statement, the ?: operator, GOTO statement, Decision making and looping: The while loops, do statement, for statement, Jump in loops, Arrays: One and two dimensional arrays and initialization, Multidimensional arrays, Structures, pointers and file handling.

Reference:

1. Peter Norton's, Introduction to computers, Peter Norton, McGraw-Hill Technology Education.
2. E Balaguru Swamy, Programming in ANSI C, Tata McGraw-Hill Publishing Company Limited.
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Pearson Education Inc.E.Balagurusamy, Computing fundamentals and C Programming, Tata McGraw-Hill Publishing Company Limited.
4. P. B. Kotur, Computer Concepts and C Programming.
5. Yeshwanth Kanetkar, Let us C.

MSC 2.5: Practical- I: Algorithms and DBMS Lab.

Practical: 4 hrs./week **Credits: 02**

Max Marks: 70 Cont. Assessment. 30

Section-I: To understand the design and analysis of algorithms, following assignments shall be implemented using C/C++.

1. Divide-And-Conquer algorithms for searching and sorting.
2. Strassen's matrix multiplication
3. Dynamic programming: Warshall's algorithm and Dijkstra's algorithm
4. Greedy algorithm
5. FFT
6. Integer multiplication

Section-II: 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

MSC 2.6: Practical -II: Visual Programming Lab.

Practical: 4 hrs./week **Credits: 02**

Max Marks: 70 Cont. Assessment. 30

Assignments related to VB/VB.NET 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 3.1HC: Programming in JAVA

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

Unit I **10Hrs**

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 **10Hrs**

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 **6Hrs**

Applet Programming - Creating and executing Java applets, inserting applets in a web page, AWT Classes, Event Handling & Swing Classes.

Unit IV **8Hrs**

Multithreading Fundamentals, Java Thread model: priorities, synchronization, messaging, thread class, Runnable interface, Interthread communication, suspending, resuming and stopping threads.

Unit V **10Hrs**

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.

Credits: 04

10Hrs

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10Hrs

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s protection,
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creating your

6Hrs

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3Hrs

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Unit VI **8Hrs**

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.
4. Bruce Eckel, Thinking in Java, 3/e, Prentice Hall.
5. Bill Shannon, Mark Hapner, Vlada Matena, James Davidson, Eduardo Pelegri-Llopart, Larry Cable, Java 2 Platform Enterprise Edition, Platform and Component Specifications , Addision Wesley.
6. Partrick Naughton, Herbert Schidlt, JAVA 2 -The Complete Reference, Tata McGraw Hill.

MSC 3.2HC: Data Communications and Computer Networks

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

UNIT I — 06Hrs

Data Communications:, Network Components and Categories, types of Connections, Topologies –Protocols, ISO / OSI model, Transmission Media, Coaxial Cable, Fiber Optics, Line Coding.

UNIT II — 12Hrs

Data Link Layer: Error detection and correction, Parity, LRC, CRC, Hamming code, Flow Control and Error control, stop and wait, go back-N ARQ, selective repeat ARQ- sliding window, HDLC., LAN, Ethernet IEEE 702.3, IEEE 702.4, IEEE 702.5, IEEE 702.11, FDDI, SONET, Bridges.

UNIT III — 06Hrs

Network Layer: Internetworks, Packet Switching and Datagram approach, IP addressing methods, Subnetting, Routing, Distance Vector Routing, Link State Routing, Routers.

UNIT IV — 10Hrs

Transport Layer: Multiplexing, Demultiplexing, Sockets, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion Control, Quality of services (QOS).

UNIT V — 10Hrs

Application Layer: Domain Name Space (DNS), SMTP, FTP, HTTP – WWW

UNIT VI — 8Hrs

Security: Cryptography, network security, security in Internet.

Credits: 04

06Hrs

Connections,

Cable, Fiber

2Hrs

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RQ- sliding

02.11, FDDI,

5Hrs

roach, IP

te Routing,

Hrs

Protocol

f services

Hrs

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References

1. Behrouz A Forouzan, Data Communications and Networking, Tata McGraw-Hill.
2. William A. Shay, Understanding Communications and Networks, Thomson Learning.
3. William Stallings, Data and Computer Communications, 7/e, Pearson Education.
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 3.3SC: Computer Graphics

Credits: 04

Teaching: 4 hrs./week
Max Marks: 70 Cont. Assessment. 30

6Hrs

Unit I

Introduction to computer graphics, programming in sample raster graphics package (SRGP), graphics hardware.

10Hrs

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.

10Hrs

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.

8Hrs

Unit IV

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

8Hrs

Unit V

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

10Hrs

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.

Credits: 04

6Hrs

hics package

10Hrs

verting lines
filling, thick

10Hrs

nates, matrix
mation, 3D-

8Hrs

ubic curves

8Hrs

ace software

10Hrs

ficient visible
er algorithm
lgorithm for

References:

1. James D. Foley, Andres Van Dam, Steven K. Feiner, and John F. Hughies, Computer Graphics- Principles and Practice, 2/e, Pearson Education (3006).
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.

MSC 3.4OE: Information Technology

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

UNIT I **14Hrs**

Computer Networks: Definition, network types, network topology, network devices, OSI model, TCP/IP model, Local Area Network (LAN), Wide Area Network(WAN),Internetworking, IP addressing methods:IP addressing scheme,IP address hierarchy, classes of IP address & dotted decimal notation, addressing example special IP address

UNIT II **8Hrs**

Internet Evolution, Basic Internet Terminology, Internet Essentials, Internet Services – USENET, TELNET,FTP,E-mail,HTTP, IRC, WORLD WIDE WEB.

UNIT III **4Hrs**

Search Engines: Popular search engines, how to register a web site on internet, Blogs, Overview of HTML.

Credits: 04

14Hrs

work devices
Wide Area
ng scheme,IP
ssing example

8Hrs

net Services –

4Hrs

rnet, Blogs,

References

1. Douglas E Comer ,Internetworking with TCP/IP, Vol. I-Principles,Protocols,& Architecture,3/e,PHI.
2. V. Rajaraman, Introduction to Information Technology, PHI
3. P. K. Singh, Introduction to Computer Networks, V. K. Publications, New Delhi
4. Rachna Sharma, Computer Networks, University Science Press, Laxmi Publications.
5. Jesse Feiler, Managing the Web Based Enterprise, Morgan Kaufmann
6. Internet and Web Design, DOEACC 'O' level, Firewall Media.
7. Chuck Musciano & Bill Kennedy, HTML & XHTML, SPD
8. Hossien Bidgoli, Elcetronic Commerce- Principles and Practice, Academic Press.
9. Efraim Turban, David King, Danis, Jae Lee, Electronic Commerce, Prentice Hall.
10. S.Jaiswal , Doing Business on the Internet : E – Commerce, Galgotia Pub.
11. Thomas A. Powell, the Complete Reference HTML.

MSC 3.5: Practical -I: Java Prog. and Computer Networks Lab.

Practical: 4 hrs./week **Credits: 02**

Max Marks: 70 Cont. Assessment. 30

Section I : Assignments shall be implemented using following features of JAVA:

- Classes, objects, constructors and destructors
- Packages, Inheritance, Event Handlers
- *Applets*
- Exceptions and debugging
- Threads, multithreading
- Database connectivity
- File handling

Section II : Following assignments shall be implemented in Java/C++.

- For error detecting code using CRC-CCITT (16-bits).
- Simple RSA algorithm to encrypt and decrypt the data.
- Hamming Code generation for error detection and correction.
- Congestion control using Leaky bucket algorithm
- A simple form with input fields for a name and an email address
- Using an understanding and assignment submission on the following commands: If con fig, net

  stat, ping, arp, telnet, fttp, ftp, finger
- To find and print the address of a local machine
- To download a web page
- Simple web browser
- A client / server program where in when the client makes a connection to the server, the server sends the system details of the server machine along with date and time
- Construct datagram packet to receive data

The following experiments shall be conducted using either NS/OPNET or any other simulators.

1. Simulate a three nodes point-to-point network with duplex links between them. Set the queue size vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP.
3. Simulate the different types of Internet traffic such as FTP a TELNET over a network and analyze the throughput.
4. Simulate the transmission of ping messaged over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
5. Simulate an Ethernet LAN using N-nodes (6-10), change error rate and data rate and compare the throughput.

MSC 3.6: Practical -II: Computer Graphics Lab.

Practical: 4 hrs./week **Credits: 02**
Max Marks: 70 Cont. Assessment. 30

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
- *Hidden surfaces*

M. Sc. IV Semester

MSC 4.1HC: Internetworking and Web Design

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment. 30

Unit I **10Hrs**

Internetworking: Motivation, physical connection with routers, internet architecture, concept of Universal service, virtual networks, protocols for internetworking, layering and TCP/IP protocols.

Internet protocol addresses: IP addressing scheme, IP address hierarchy, classes of IP addresses and dotted decimal notation, addressing example, special IP addresses, address resolution- ARP, ARP message delivery and format

IP datagrams and datagram forwarding, IP encapsulation, fragmentation and reassembly.

Unit II **6Hrs**

IPv6: Characterization of features in IPv6, IPv6 datagram format, IPv6 base header format, fragmentation reassembly and path MTU, IPv6 addressing, IPv6 colon hexadecimal notation.

An error reporting mechanism (ICMP), TCP.

Unit III **12Hrs**

Web page building blocks, basic (X)HTML structure, basic (X)HTML formatting, images, links, style sheet building blocks, formatting with styles, dynamic effects with styles,

layout with styles, list, tables, forms, video, audio, and other multimedia. Testing and debugging web pages.

Unit IV **10Hrs**

XML: What is XML?, limitations of HTML, an XML sample, elements, attributes and values, XSL, DTD, XML schema, name spaces, W3C recommendations, XML In practice-AJAX, RSS, and SOAP.

Unit V **14Hrs**

JAVA Script: The JAVA Script programming language, creating JavaScript source file, hiding JavaScript from incompatible browsers, variables, functions, objects and events, data types and operators, decision making with control structures and statements, windows and frames, working with forms in JavaScript, using JavaScript with CSS styles, cookies and security, introduction to document object model, debugging JavaScript, server side JavaScript, database connectivity, working with Java Applets and embedded data.

References:

1. Douglas E Comer, Computer Networks and Internet, Pearson Education.
2. Kevin Howard Goldberg, XML- Visual quick start guide, Peachpit Press.
3. David Hunter, Jeff Rafter, Joe, Eric, Danny, John, Andrew, Linda, Beginning XML, WROX publications.
4. Elizabeth Castro, HTML, XHTML, and CSS, Peachpit Press.
5. Deitel, Deitel, and Nieto, Internet & World Wide Web-How to Program, PHI.
6. Don Gosselin, JavaScript, Web Warrior Series,3/e, Thomson Learning.
7. Douglas E. Comer, Internetworking With TCP/IP, Vol. II: Design, Implementation, And Internals, 3/E, PHI.
8. Paul Wilton and Jeremy McPeak, Beginning Java Script, Wrox Publications.
9. Karl Barksdale, E. Turner, HTML, JavaScript, and Advanced Internet Technologies, Web Warrior Series,3/e, Thomson Learning.

MSC 4.2HC: Software Engineering

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

Unit I

8Hrs

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

Unit

8Hrs

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

Unit III

10Hrs

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

Unit IV

10Hrs

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

8Hrs

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 8Hrs

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

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. T. C. Lethbridge and R. Laganiere, Object Oriented Software Engineering, Tat McGraw Hill.
5. Priestley, Practical Object Oriented Design using UML, TMH
6. Page Jones, Meiler, Fundamentals of object oriented design in UML.
7. Roff, UML: A Beginner's Guide, TMH

MSC 4.3SC: Elective-I

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

MSC4.3SC(a): Bioinformatics

MSC4.3SC(b): Artificial Intelligence

MSC4.3SC(c): Neural Networks and Fuzzy Systems

MSC4.3SC(d): Theory of Computation

MSC4.3SC(e): Pattern Recognition

MSC 4.4SC: Elective-II

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

MSC4.4SC(a): Data Warehousing and Mining

MSC4.4SC(b): Embedded Systems

MSC4.4SC(c): Advanced Computer Architecture

MSC4.4SC(d): Mobile Communications

MSC4.4SC(e): Digital Image Processing

edits: 04

dits: 04

MSC 4.5: Practical - I: SC Lab and Web Design Lab

Practical: 4 hrs./week **Credits: 02**

Max Marks: 70 Cont. Assessment. 30

Section I : SC Lab.

Lab. Assignments shall be carried out based on paper MSC 4.3 and MSC4.4.

Section II: Web Design

Following features of HTML and XML shall be implemented.

HTML: Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, List Tags, Hyperlinks, Image & Image map, Table Tags, Form Tags, Frame Tags, dynamic HTML, Executable Content Tags and Style Sheets,

XML: XML declarations, XML parsers(SAX, DOM, XSLT)

XML using CSS- Internal DTD, External DTD

Following assignments shall be implemented in the lab. in addition to the assignment given by the course teacher.

1. To change the appearance of part of a document by invoking JavaScript code from a hyperlink.
2. To pop up a window from an existing browser window, and then to communicate with the opener. The effect achieved should be this: an initial window with a hyperlink, which can be clicked to open a new window.
3. To produce a day selection control, that allows the selection of a day from a month. The month is specified by two parameters: the day of the week on which the first day falls, and the number of days in the month. The popup control should be invoked with a call to a user-defined function called **get Day (startDay, nDays)**. The control should only show this information; no year or name of month should be show
4. Create a form having number of elements (Textboxes, Radio buttons, Checkboxes, and soon). Write JavaScript code to count the number of elements in a form.
5. Create a HTML form that has number of Textboxes. When the form runs in the Browser fill the textboxes with data. Write JavaScript code that verifies that all textboxes has been filled. If a textboxes has been left empty, popup an alert indicating which textbox has been left empty.

6. Develop a HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluates the expression and Displays the result.
7. Create a page with dynamic effects. Write the code to include layers and hyperlink animation.
8. Write a JavaScript code to find the sum of N natural Numbers. (Use user defined function)
9. Write a JavaScript code block using arrays and generate the current date in words, this should include the day, month and year.
10. Create a form for Student information. Write JavaScript code to find Total, Average, Result and Grade.

Create a form consists of a two Multiple choice lists and one single choice list,

- The first multiple choice list, displays the Major dishes available.
- The second multiple choice list, displays the Starters available.
- The single choice list, displays the Soft drinks available.

The selected items from all the lists should be captured and displayed in a Text Area along with their respective costs. On clicking the 'Total Cost' button, the total cost of all the selected items is calculated and displayed at the end in the Text Area. A 'Clear' button is provided to clear the Text Area.

11. Write a JavaScript code block, which checks the contents entered in a form's Text element. If the text entered is in the lower case, convert to upper case. Make use of function to Uppercase ( ).
12. Create a web page using two image files, which switch between one another as the mouse pointer moves over the images. Use the onMouseOver and onMouseOut event handlers.
13. Create a program to generate a hit counter.
14. Create a program to verify whether email address provided by user is valid or Invalid

MSC 4.6: Practical-II: PROJECT WORK

Practical: 4 hrs./week **Credits: 02**

Max Marks: 70 Cont. Assessment. 30

- Each student shall carry out an individual project in the Lab.
- The Guide shall be concerned teacher in the department.
- The Project topic should be chosen in consultation with the guide.
- Student shall carry out the analysis and design work for the chosen problem statement and develop the s/w in the Lab.
- The student shall submit two copies of the dissertation documenting the project work carried out by him/her to the Chairman/Head of the Department at the end of the semester term.
- Refer Annexure for Project documentation details.

Elective-I

MSC 4.3SC(a): Elective-I: Bioinformatics

Credits: 04

Teaching: 4 hrs./week
Max Marks: 70 Cont. Assessment. 30

10Hrs

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.

10Hrs

Unit II

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

10Hrs

Unit III

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

10Hrs

Unit IV

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

8Hrs

Unit V

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

Unit VI **4Hrs**

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

References

1. Xiong Jin, *"Essential Bioinformatics"*. Cambridge University Press, First South Asian edition.
2. Setubal Joao Carlos, Joao Meidanis, Jooao Carlos Setubal *"Introduction to Computational Molecular Biology"*, Thomson Learning, First Reprint, 3003
3. Mount W David, *"Bioinformatics Sequence and Genome Analysis"*. CBS Publishers, First Indian Reprint, 3005
4. Krane E Dan and Michael L Raymer, *"Fundamental Concepts of Bioinformatics"*. Pearson Education Inc., First Indian Reprint, 3003

MSC 4.3SC(b): Elective-I: Artificial Intelligence

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

Unit I **8Hrs**

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 **8Hrs**

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

H

Unit III1 **10Hrs**

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 **10Hrs**

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 **10Hrs**

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

Unit VI **6Hrs**

Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts.

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 4.3SC(c): Elective-I: Neural Networks and Fuzzy Systems

Teaching: 4 hrs. /week **Credits: 04**
Max Marks: 70 Cont.Assessments.30

Unit I 10Hrs

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 12Hrs

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

Unit III 8Hrs

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

Unit IV 8Hrs

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

Unit V 8Hrs

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

Unit VI **6Hrs**

Fuzzy Systems: Crisp logic, predicate logic, fuzzy logic, fuzzy rule based systems, defuzzification methods, and 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 (30056.
3. Bart Kosko, Neural networks and fuzzy systems - A dynamical systems approach to machine intelligence, PHI.

MSC 4.3SC(d): Elective-I: Theory of Computation

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment. 30

Unit–I **10Hrs**

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 **14Hrs**

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 **14Hrs**

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

Unit IV **14Hrs**

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.

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 4.3SC(e): Elective-I: Pattern Recognition

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment. 30

Unit I **6Hrs**

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

Unit II **8Hrs**

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 **12Hrs**

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 **10Hrs**

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

Unit V **8Hrs**

Clustering: Introduction, Hierarchical Clustering, Partitional Clustering.

Unit VI **10Hrs**

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.

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.

Elective-II

MSC 4.4SC(a): Elective-II: Data Warehousing and Mining

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

UNIT-I **12Hrs**

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

UNIT-II **12Hrs**

Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage.

Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems

UNIT-III **10Hrs**

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

UNIT-IV **10Hrs**

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

UNIT-V **08 Hrs**

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

References:

1. Jiawei Han & Micheline Kamber , Data Mining – Concepts and Techniques, Harcourt India.
2. Arun K Pujari , Data Mining Techniques , University Press
3. W. H. Inmon,, Building the DataWarehouse-, Wiley Dreamtech India Pvt. Ltd..
4. Sam Anahory & Dennis Murray, Data Warehousing in the Real World, Pearson Edn Asia.
5. Paulraj Ponnaiah , Data Warehousing Fundamentals, Wiley Student Edition
6. Ralph Kimball , The Data Warehouse Life cycle Tool kit –Wiley Student Edition
7. Margaret H Dunham , Data Mining Introductory and advanced topics, Pearson Education

MSC 4.4SC(b): Elective-II: Embedded Systems

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

Unit I **8Hrs**

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 **12Hrs**

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 *10Hrs*

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 **12Hrs**

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 **10Hrs**

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 7051Microcontroller 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 7051 Microcontroller, TMH

MSC 4.4SC(c): Elective-II: Advanced Computer Architecture

Teaching: 4 hrs./week **Credits: 04**

Max Marks: 70 Cont. Assessment. 30

Unit I **10Hrs**

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 **14Hrs**

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 **14Hrs**

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

Unit IV **14Hrs**

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

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 (3005)
3. Kain, Advanced Computer Architecture-A Systems Design Approach, PHI(3006).
4. Kai Hwang, Advanced Computer Architecture, McGraw Hill (3000).

MSC 4.4SC(d): Elective-II: Mobile Communications

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment. 30

Unit I **12Hrs**

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 **8Hrs**

Medium access control: SDMA, FDMA, TDMA, CDMA

Unit III **8Hrs**

Telecommunications ans satellite systems: GSM, DELT, TETRA, UMTS, and IMT-3000, basics of satellite systems, routing.

Unit IV **8Hrs**

Broadcast Systems: Cyclical repition of data, digital audio broadcasting, digital video broadcasting.

Unit V **8Hrs**

Wireless Lan: infrared vs radio transmission, infrastructure and adhoc network, Blue Tooth.

Unit VI **8Hrs**

Mobile Network Layer and Transport Layer: Mobile IP, dynamic host configurartion protocol, mobile adhoc networks, traditional TCP, classical TCP improvements.

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 4.4SC(e): Elective-I: Digital Image Processing

Teaching: 4 hrs./week **Credits: 04**
Max Marks: 70 Cont. Assessment. 30

Unit I **8Hrs**

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 **8Hrs**

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 **10Hrs**

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

Unit IV **10Hrs**

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 **10Hrs**

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

Unit VI **08 Hrs**

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

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.

ANNEXURE-I

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 "_____" submitted in partial fulfillment of the degree of Master of Science (Computer Science) to the Department of Computer Science, _____ (University/College Name), carried out by Mr./Ms._____, Reg No. _____ is a bonafide work carried out by him/her under my supervision. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to this or any other University/Institution to the best of my knowledge and belief.

Signature of the Guide

COVER PAGE

6. *Titleofthethesis/report*

(Times New Roman, Italic, Font size = 24)

7.

8

9

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)

Reg. No.:

Submitted to

VIJAYANAGARA SHRI KRISHNA DEVARAYA UNIVERSITY, BELLARY

College/Department

College Name and City

DECLARATION

This is to certify that the dissertation/project report entitled "_____" is carried out by me under the supervision of of _____, for the partial fulfillment of the requirements for the award of the degree of M.Sc in Computer Science. The contents embodied in this project work, in part or whole, has not been submitted earlier for award of any degree or diploma to this or any other University/Institution.

Signature of the student

Name of the Student

Reg. No.