THE UNIVERSITY OF BURDWAN

DEPARTMENT OF COMPUTER SCIENCE

SYLLABUS FOR M.Sc. in Computer Science (DDE Mode)

Theory	**Univ.Exam. + Sessional**
Semester –I	
MCS – 101 : Advanced Data Structures & Algorithms	45 + 5
MCS – 102 : Theory of Computing	45 + 5
MCS – 103 : Object Oriented Programming	45 + 5
MCS – 104 : Computer Organization and Architecture	45 + 5
MCS – 105 : Data Structures Lab	50
MCS – 106 : OOP Lab	50
Semester –II	
MCS – 201 : Software Engineering	45 + 5
MCS – 202 : Artificial Intelligence	45 + 5
MCS – 203 : Computer Networking	45 + 5
MCS – 204 : Compiler Design Theory	45 + 5
MCS – 205 : AI & S/W Engg. Lab	50
MCS – 206 : Compiler & Networking Lab	50
Semester –III	
MCS – 301 : Object Oriented Analysis and Design	45 + 5
MCS – 302 : Advanced Operating Systems	45 + 5
MCS – 303 : Advanced DBMS	45 + 5
MCS – 304 : Elective - I	45 + 5
MCS – 305 : OOAD & DBMS Lab	50
MCS – 306 : Unix & E-I Lab	50
Semester –IV	
MCS – 401 : Elective -II	45 + 5
MCS – 402 : Elective -III	45 + 5
MCS – 403 : Elective -IV	45 + 5
MCS – 404 : Dissertation	50
MCS – 405 : Elective -II Lab	50
MCS – 406 : Elective –III & Elective -IV Lab	50

Electives

Elective – I (General) (Choose only one from the following)

1. Analysis of Algorithm
2. Advanced Microprocessors
3. Image Processing

Elective – II, III & IV (Choose one Paper from each group from the following)

Elective – II : Internet Technology Group

4. Cryptography and Network Security
5. Mobile Computing
6. Internet & E - Commerce

Elective – III : Soft Computing Group

7. Neural Network
8. Pattern Recognition
9. Fuzzy Logic & GA

Elective – IV : Scientific Computing Group

10. Numerical and Statistical Algorithms
11. Computer Graphics and Multimedia
12. Optimization Technique

Semester –I

MCS – 101 : Advanced Data Structures & Algorithms	45 + 5
MCS – 102 : Theory of Computing	45 + 5
MCS – 103 : Object Oriented Programming	45 + 5
MCS – 104 : Computer Organization and Architecture	45 + 5
MCS – 105 : Data Structures Lab	50
MCS – 106 : OOP Lab	50

MCS-101: ADVANCED DATA STRUCTURES & ALGORITHMS

UNIT-I **[20%]**

Introduction to Data Structures , ADT, array, row major and column major representation of array, stack, queue, priority queue, implementation of stack, queue, array using C++/JAVA, applications of stack & queue for solving problems.

UNIT-II **[20%]**

Introduction to linked-lists, definition, implementation using C++/JAVA, operations on linked-list, querying and searching a liked list, doubly linked list, different operations on doubly linked list, applications of linked list.

Binary heap and its property, implementation in C++/Java, application of binary heap in priority queue, heap sort.

UNIT-III **[20%]**

Introduction to binary trees, properties of a binary tree, notion of a search tree, implementation of binary search tree, operations on binary tree, querying a binary tree.

Balancing a tree, height balance tree, AVL trees, Red-Black trees.

UNIT-IV **[20%]**

Notion of Estimation of time and space complexity, best, worst and average case analysis , Big-OH notation , solution of recurrence.

Basics of searching, sequential search, binary search.

Fundamentals of sorting, methodology, implementation and algorithm analysis of insertion sort, merge sort, quick sort, radix sort. Shell short, analysis of different sorting techniques.

UNIT-V **[20%]**

Introduction to graph, properties, representations of graph, graph traversal, BFS, DFS, application of BFS and DFS, topological sorting , spanning tree of a graph, minimum cost spanning trees, Kruskal's algorithm, Prim's algorithm, finding shortest path and Dijkstra's algorithm, analysis of different algorithms.

REFERENCE BOOKS:

1. T. Cormen, C. Leiserson and R. Rivest: ***Introduction to Algorithms***, PHI

2. Horowitz & Sahni, ***Fundamentals of Data Structures in C++***, Universities Press

3. Horowitz & Sahni, ***Fundamentals of Data Structures using JAVA***, Universities Press

MCS-102: THEORY OF COMPUTING

UNIT-I **[20%]**

Preliminaries (strings, alphabets & languages, graphs & trees, set & relations), definition of automata, recognition of a language by an automata , idea of grammar, introduction to finite automata, Deterministic Finite Automata (DFA), examples of DFA, Non-Deterministic Finite Automata (NFA), examples of NFA, language accepted by FA, equivalence of NFA and DFA, Minimization of FA, Moore machine, Mealy machine, conversion between them.

UNIT-II **[20%]**

Introduction to regular expressions, examples, conversion from DFA to regular expressions and vice-versa, regular languages, properties of regular languages, regular grammar, left linear and right linear grammar, grammar and DFA conversion, pumping lemma for regularity, identification of non-regular languages.

UNIT–III **[20%]**

Introduction to context free languages and examples, context free grammar and examples, example of CFL, derivation trees, simplification of Context-Free Grammar (CFG), parse trees and ambiguous grammar, normal form of grammar, Chomsky and Geribach normal forms.

UNIT–IV **[20%]**

Properties of context free languages, pumping lemma for CFL, identification of non-context free language.

Introduction to pushdown automata, definition, moves, instantaneous descriptions, deterministic & non-deterministic pushdown automata (PDA), acceptance by final state & acceptance by empty stack, equivalence of CFG and PDA.

UNIT-V **[20%]**

Introduction to Turing Machines(TM), definition and examples of a Turing machine, extensions of Turing machines, variations of a Turing machine, non-deterministic Turing machines, Equivalence of various Turing machines, formalisms, unrestricted grammar.

Introduction to linear bound automata, context sensitive grammars.

Undecidability, Church-Turing thesis, universal Turing machines, Halting problem & other unsolvable problems, computational complexity & NP-completeness, class P & NP, reductions, dealing with NP-Completeness

Recursive and recursively enumerable languages and their properties, Chomsky Hierarchy.

REFERENCE BOOKS:

1. Hopcroft J. E. and Ullman J. D., ***Introduction to Automata Theory, Languages & Computation***, Narosa.

2. Lewis H. R. and Papadimitriou C. H., ***Elements of the theory of Computation***, P.H.I.

3. Peter Linz, **An *Introduction to formal language and Automata*,** Narosa

MCS-103: OBJECT ORIENTED PROGRAMMING

UNIT-I **[20%]**

Principles of Object Oriented Programming (OOP), software evolution , OOP

Paradigm, basic concepts of OOP, Object Oriented languages , Application areas.

Review of C++ and Java as OOP language.

UNIT-II **[20%]**

Classes and objects, constructors & destructors, operator overloading and type conversions.

UNIT-III **[20%]**

Inheritance, single inheritance, multilevel inheritance, hybrid inheritance, pointers, virtual functions and polymorphism.

UNIT-IV **[20%]**

File Management.

Templates & Exception Handling.

UNIT-V **[20%]**

Introduction to Object Oriented Analysis & Design using UML.

REFERENCE BOOKS:

1. D. Jana, ***C++ and Object-Oriented Programming Paradigm*** , PHI.
2. E. Balaguruswamy, ***Objecting Oriented Programming through C++*** , TMH.
3. Robert Lafore, ***Object Oriented Programming in Turbo C++***, Galgotia.
4. James Gosling et al, ***JAVA Programming Language***, Pearson Education.

MCS-104: COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT-I **[20%]**

Review of Combinational & sequential Circuits, Generation of computers, Von-Neumann architecture, block diagram of computer,

UNIT-II **[20%]**

The memory system, memory hierarchy , RAM, ROM, DRAM, flash memory, need of secondary storage technologies, secondary memory and characteristics, Optical memories, hard disc drives, CCDS, bubble memories, RAID and its levels, The concepts of high speed memory, cache organization, memory systems of micro-computers ,

UNIT-III **[20%]**

Introduction to I/O organization, input/output system, input/ output interfaces, idea of device controllers, input output techniques, I/O processors , I/O transfer, DMA,

external communication interfaces , interrupt, types of interrupt, bus arbitration , I/O devices, video cards , monitors, USB ports, LCD, Sound cards, modems, printers, scanners, digital cameras, keyboards, mouse, power supply.

UNIT-IV **[20%]**

Basics of processor, central processing unit, instruction sets and instruction formats, instruction set architecture, types of instructions, operands, addressing modes & their importance, registers, micro-operations, description of various types of registers of a typical microprocessor, characteristics of ALU, control unit ,hardware control, micro programmed control , microinstructions the execution of micro-programs.

UNIT-V **[20%]**

Introduction to 8086 microprocessor, architecture of 8086 microprocessor, assembly language programming using 8086 microprocessor, instruction formats, addressing modes of 8086 microprocessor, types of instructions, I/O assembly level programs , I/O services , assembly programming tools, interrupts and handling interrupts.

REFERENCE BOOKS:

1. M. M. Mano, ***Computer system Architecture***,PHI

2. J. P. Hayes, ***Computer Architecture & Organization***,McGraw Hill

3. A.S. Tanenbaum, ***Structured Computer Organization***,PHI

4. V. C. Hammacher, ***Computer Organization***, 4th Edn.,TMH

5. Liu & Gibson, ***Microcomputer System***,*PHI*

MCS-105: DATA STRUCTURE LAB

Problems Related to MCS-101.

MCS-106: OOP LAB

Problems Related to MCS-103.

Semester –II

MCS – 201 : Software Engineering	45 + 5
MCS – 202 : Artificial Intelligence	45 + 5
MCS – 203 : Computer Networking	45 + 5
MCS – 204 : Compiler Design Theory	45 + 5
MCS – 205 : AI & S/W Engg. Lab	50
MCS – 206 : Compiler & Networking Lab	50

MCS-201: SOFTWARE ENGINEERING

UNIT–I **[20%]**

Software characteristics, components & applications, software engineering - a layered technology, Software Process.

Introduction to software engineering models, linear sequential model, prototype & RAD model, evolutionary software process model, incremental model and spiral model

Basics of software project management, project management concepts, people, problem & process.

Notion of project metrics, metrics in the process & project domains, software measurement, size oriented, function oriented metrics, extended function

UNIT-II **[20%]**

Idea of software project planning, scope of planning, project estimation, project decomposition techniques, empirical estimation models.

Introduction to software analysis, requirement analysis, communication techniques, analysis principles, software prototyping, specifications.

Elements of the analysis modeling, data modeling, functional modeling & information flow, behavioral modeling, data dictionary.

UNIT–III **[20%]**

Design process, design concepts, design principles, effective modular design.

Different design methods, architectural design process, transform mapping & transaction mapping, internal external design, human computer interface design, interface design guidelines, procedural design, object oriented design.

UNIT–IV **[20%]**

Introduction to software quality, quality concepts, metrics for software quality, quality movement, S/W Q A, S/W review, formal approaches to software quality assurance, S/W reliability, ISO standards

Fundamentals of software testing, test case design, white and black box testing, basic path testing, control structures.

Strategic approach to software testing, unit testing, integration testing, validation testing, system testing, alpha testing, beta testing, debugging.

UNIT-V **[20%]**

Software reusability, reuse process, building reusable components, classified & retrieving components, economics behind software reusability.

Introduction to computer aided software engineering (CASE),, building block for CASE, taxonomy of CASE tools, integrating CASE environment, integrating architecture, CASE repository.

REFERENCE BOOKS:

1. R.S.Pressman, ***Software Engineering***
2. Pankaj Jalote, ***An Integrated Approach To Software Engineering***
3. Rajib Mall, **Fundamentals of Software Engineering**, PHI

MCS-202: ARTIFICIAL INTELLIGENCE

UNIT–I **[20%]**

Introduction to artificial intelligence, overview of knowledge, importance of AI, AI & related fields, AI techniques (heuristic techniques & search techniques) domains, problems, dealing with incompleteness, inconsistencies & uncertainties.

Fundamentals of knowledge representation, definition of knowledge, importance of knowledge, knowledge representation, various approaches of knowledge representation, issues in knowledge representation using predicate logic, representing

simple facts in logic, representing instances, representing is-a relationship, computable function and predicate, knowledge indexing & retrieval techniques, integrating knowledge in memory, memory organization systems.

UNIT-II **[20%]**

AI programming languages, introduction to LISP (syntax & numeric functions), basic list manipulation & conditionals, input, output & local variables, iterations & recursions, property lists & arrays, introduction to PROLOG.

Introduction to formalized symbolic logic, first order predicate logic, inference rules, normal forms, well-formed formulas (WFF), conversion to clausal form, resolution principle, non-deductive inference method.

UNIT–III **[20%]**

Basics of structured knowledge, associative networks, conceptual graphs, frame, conceptual dependencies, scripts.

Overview of object oriented relationship, object-oriented system, objects, classes, message and methods, fundamental principles.

UNIT–IV **[20%]**

Preliminary concepts of search & control strategies, examples of search problems, uniformed or blind search, informed search, searching and-or graph, heuristics.

Matching techniques, structures used in matching, measure for matching, matching like patterns, partial matching algorithms, the RETE matching algorithm.

UNIT-V **[20%]**

Overview of natural language processing, overview of linguistics, grammar and language, basic parsing techniques, recursive transition networks, augmented transition networks.

Introduction to expert system, rule based system architectures, black board system architectures, decision tree architectures, types of learning, general learning model, forward and backward chaining.

REFERENCE BOOKS:

1. Rich & Knight, ***Artificial Intelligence***, TMH
2. Russel & Norvig, ***Artificial Intelligence, a Modern Approach***, Pearson Education
3. Patterson, ***Artificial Intelligence and Expert systems***, PHI

MCS-203: COMPUTER NETWORKING

UNIT–I **[20%]**

Introduction to computer networking, needs and advantages of network, data communication components.

Transmission technology , direction of data flow (simplex, half duplex, full duplex).

Categories of network (LAN, MAN, WAN), internet, brief history of internet, internet today; protocols and standards, reference models, OSI reference model, TCP/IP reference model, comparative study of OSI and TCP/IP reference model.

Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & non-guided), base band and broadband transmission, TDM, FDM, WDM, telephone network.

UNIT-II **[20%]**

Types of errors, framing (character and bit stuffing), error detection & correction methods; flow control.

Idea of protocol, stop & wait ARQ, Go-Back- N ARQ, selective repeat ARQ, HDLC.

Point to point protocol, LCP, NCP, FDDI, token bus, token ring, reservation, polling, concentration.

UNIT–III **[20%]**

Basics of multiple access protocols, pure ALOHA, slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; traditional Ethernet, fast Ethernet.

Different networking devices, repeaters, hubs, bridges, switches, router, gateway.

Idea of addressing, internet address, classful address, subnetting.

UNIT–IV **[20%]**

Idea of routing, different techniques, static vs. dynamic routing , routing table for classful address, routing algorithms, shortest path algorithm, flooding, distance vector routing, link state routing; protocols: ARP, RARP, IP, ICMP, IPV6.

Congestion control, Congestion control algorithms, leaky bucket algorithm, token bucket algorithm, choke packets; UDP, TCP, quality of service, techniques to improve quality of ervices.

UNIT–V **[20%]**

DNS, SMTP, SNMP, FTP, HTTP & WWW.

Introduction to network security, cryptography, user authentication, Firewalls.

ISDN services & ATM, DSL technology, cable modem, sonnet.

Idea of wireless LAN, IEEE 802.11, introduction to blue-tooth, VLAN, cellular telephony & satellite network.

REFERENCE BOOKS:

1. A. S. Tanenbaum , ***Computer Networks***, (4th Ed.), Pearson Education

2. W. Stallings, ***Data and Computer Communications***, (5th Ed.), Pearson Education

B. A. Forouzan, ***Data Communications and Networking***, (3rd Ed.), TMH

MCS-204: COMPILER DESIGN THEORY

UNIT–I **[20%]**

Notion of compiler, analysis of the source program, phases of a compiler, grouping of phases, compiler construction tools, lexical analysis, role of lexical analyzer, input buffering, specification of tokens.

UNIT–II **[20%]**

Role of the parser, basics of grammar, writing grammars, context-free grammars,top down parsing, recursive descent parsing, predictive parsing, bottom-up parsing, shift reduce parsing, operator precedent parsing, LR parser, SLR parser, canonical LR parser, LALR parser.

UNIT–III **[20%]**

Intermediate languages, declarations, assignment statements, Boolean expressions, case statements, back patching, procedure calls.

UNIT–IV **[20%]**

Issues in the design of code generator, target machine, runtime storage management, basic blocks and flow graphs, next-use information, a simple code generator, dag representation of basic blocks, peephole optimization.

UNIT-V [20%]

Introduction to code optimization, principal sources of optimization, optimization of basic blocks, introduction to global data flow analysis, runtime environments, source language issues, storage organization, storage allocation strategies, access to non-local names, parameter passing.

REFERENCE BOOKS:

1. Allen I. Holub, ***Compiler Design in C***, Prentice Hall of India, 2003.
3. J. P. Bennet, ***Introduction to Compiler Techniques***, 2nd Ed., Tata McGraw-Hill, 2003.
5. Kenneth C. Louden, ***Compiler Construction: Principles and Practice***, Thompson Learning, 2003

MCS-205: AI & S/W ENGG. LAB

Problems Related to MCS-201 & MCS-202.

MCS-206: COMPILER & NETWORKING LAB

Problems Related to MCS-203 & MCS-204.

Semester –III

MCS – 301 : Object Oriented Analysis and Design	45 + 5
MCS – 302 : Advanced Operating Systems	45 + 5
MCS – 303 : Advanced DBMS	45 + 5
MCS – 304 : Elective - I	45 + 5
MCS – 305 : OOAD & DBMS Lab	50
MCS – 306 : Unix & E-I Lab	50

MCS-301: OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT–I **[20%]**

Introduction: Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language.

UNIT-II **[20%]**

Object oriented analysis usecase diagram, major and minor elements, objects, Classes.

UNIT–III **[20%]**

Object oriented design: Relationships among objects, aggregation, links, relationships among classes association, aggregation, using, instantiation, meta-class, grouping constructs.

UNIT–IV **[20%]**

Basic concepts of object oriented programming using Java : Object, class, message passing, encapsulation, polymorphism, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages.

UNIT-V **[20%]**

Fundamentals of Object Oriented design in UML :Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram, UML extensibility- model constraints and comments, Note, Stereotype.

REFERENCE BOOKS:

1. Rambaugh, James Michael, Blaha, ***Object Oriented Modelling and Design***, PHI

2. Bruce, ***Foundations of Object Oriented Languages***, PHI

3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" - TMH

4. Priestley, ***Practical Object Oriented Design using UML***, TMH

MCS -302: ADVANCED OPERATING SYSTEMS

UNIT-I **[20%]**

Definition of operating system, tasks, objectives, idea of multiprogramming, introduction to process management, concepts of process, process life cycle, process states, process scheduling, thread, context switching.

Inter process communication (IPC), critical section problem, software & hardware solutions to critical section problem, semaphores & synchronization, deadlock.

UNIT-II **[20%]**

Introduction to memory management, static & dynamic partitioning, dynamic relocation, paging, page tables, demand paging memory management, virtual memory, page replacement strategies, segmented memory management, thrashing.

UNIT-III **[20%]**

Basics of device management, device scheduling concept & algorithms, spooling.

Introduction to file management, file concept, access methods, allocation methods, directory concept, fat & i-node structures; file protection - protection mechanism and policies, disk management.

UNIT-IV **[20%]**

Overview of UNIX/Linux operating system, file system, general purpose utilities, simple filters, pipes, shell programming, systems calls.

UNIT-V **[20%]**

Introduction to distributed operating systems, distributed systems structures, design issues, distributed file systems, distributed coodinaion,

REFERENCE BOOKS:

1. Silberschatz, Galvin, Gagne, ***Operating System Concepts***, WSE Wiley
2. Tanenbaum, Woodhull, ***Operating Systems Design and Implementation***, PHI

3. Sumitabha Das, ***UNIX Concepts and Applications***, TMH
4. Kernighan & Pike, ***The Unix Programming Environment***, PHI

MCS-303: ADVANCED DBMS

UNIT–I **[20%]**

Basics of database systems, traditional file oriented approach, motivation for database approach, evolution of database systems, database basics, views of data, three level architecture of DBMS, relational database systems, data models, database languages, client-server and multi-tier architectures, multimedia data, information integration, data-definition language commands.

Data models, introduction of entity relationship model, elements of the ER model requirement, relationship, entity-relationship diagrams, multiplicity of binary ER relationships, design principles, avoiding redundancy, simplicity counts, extended ER models

UNIT–II **[20%]**

Data elements and fields, representing relational database elements, records, client-server systems, index structures, indexes on sequential files, secondary indexes, b-trees, hash tables.

Introduction to relational algebra, set operations on relations, extended operators of relational algebra, constraints on relations, modification of the database, aggregate functions.

UNIT–III **[20%]**

Introduction to relational model, functional dependencies, rules about functional dependencies, design of relational database schemas.

Introduction to normalization, normalization, first normal form, second normal form, third normal form, Boyce-Codd normal form, multi-valued dependency, fifth normal form.

UNIT–IV **[20%]**

Introduction to SQL, use of SQL, DDL statements, DML statements, view definitions, constraints, triggers, keys, primary key, foreign keys, constraints on attributes & tuples, modification of constraints cursors, dynamic SQL, introduction to PL/SQL.

Introduction to query optimization, algebraic laws for improving query plans, estimating the cost of operations, introduction to cost-based plan selection, coping with system failures, issues and models for resilient operation, redo log, undo/redo logging, protecting against media failures

UNIT–V **[20%]**

Introduction to concurrency control, serialisability, enforcing serializability by locks, locking systems with several lock modes, architecture for a locking scheduler managing hierarchies of database elements, concurrency control by timestamps, concurrency control by validation.

Introduction of transaction management, serializability & recoverability, view serializability, resolving deadlocks, distributed databases, distributed commit, distributed locking.

Different database system architectures,

Introduction to distributed database systems, homogeneous and heterogeneous database, distributed data storage, distributed transaction, commit protocols, concurrency control in distributed databases, availability, heterogeneous.

REFERENCE BOOKS:

1. Silberschatz, Korth, ***Database System Concepts***, TMH.

2. Elmasri & Navathe, ***Fundamental of DataBase System***, The Benjamin Cummins Publishing Inc.

MCS-304: ELECTIVE-I

Any one elective from elective 1, 2, 3.

MCS-305: OOAD & DBMS LAB

Problems Related to MCS-301 & MCS-303.

MCS-306: COMPILER & NETWORKING LAB

Problems Related to MCS-302 & MCS-304.

Semester –IV

MCS – 401 : Elective -II	45 + 5
MCS – 402 : Elective -III	45 + 5
MCS – 403 : Elective -IV	45 + 5
MCS – 404 : Dissertation	50
MCS – 405 : Elective -II Lab	50
MCS – 406 : Elective –III & Elective -IV Lab	50

MCS-401: ELECTIVE-II

Any one elective from elective 4, 5, 6.

MCS-402: ELECTIVE-III

Any one elective from elective 7, 8, 9.

MCS-403: ELECTIVE-IV

Any one elective from elective 10, 11, 12.

MCS-403: DISSERTATION

Project and Dissertation

MCS-405: ELECTIVE-II LAB

Problems Related to MCS-401

MCS-406: ELECTIVE-III & ELECTIVE-IV LAB

Problems Related to MCS-402 & MCS-403.

List of Electives

Elective – I (General) (Choose only one from the following)

1. Analysis of Algorithm
2. Advanced Microprocessors
3. Image Processing

1. ANALYSIS OF ALGORITHM

UNIT–I **[20%]**

Review basic data structures, linked-list, stack, queue.

Basic concepts of algorithms, worst and average case, upper and lower bounds, algorithm design principles, divide-and-conquer, growth of functions, recurrences, master method, complexity analysis of sorting techniques, insertion sort, quick sort, heap sort, merge sort.

UNIT–II **[20%]**

Dynamic programming, properties of dynamic programming, matrix-chain multiplication, longest common subsequence, optimal polygon triangulation, memoization, analysis of dynamic programming algorithms.

UNIT–III **[20%]**

Introduction to greedy algorithms, properties of greedy algorithms, problems for greedy algorithm, analysis of greedy algorithms, prove correctness of the greedy algorithm, greedy versus dynamic programming, matroid theory, correctness of the greedy algorithm on metroids.

UNIT–IV **[20%]**

Graph algorithms, breadth first search, depth first search, topological sort, connected and bi-connected components, minimum spanning trees, Kruskal's & Prim's algorithms, shortest paths, Dijkstra's algorithm , Bellman-Ford's algorithm Floyd- Warshall's algorithm, analysis of graph algorithms.

UNIT–IV **[20%]**

Algebraic algorithms, introduction to computational geometry, evaluation of polynomials, pattern matching algorithms, algorithms for set manipulation,

Introduction to parallel algorithms.

Introductory concepts of program correctness proofs, introduction to NP-completeness.

REFERENCE BOOKS:

1. Cormen, Liserson, Rivest, ***Introduction to Algorithms***, PHI

2. ADVANCED MICROPROCESSORS

UNIT–I **[20%]**

Introduction to microprocessors, microprocessor architecture.

Intel 8085 microprocessor, architecture of Intel-8085, pin configuration, instruction set, timing diagram, interrupt handling.

UNIT–II **[20%]**

Intel 8086 microprocessor, 8086 internal architecture, pin configuration, instruction set and their usage, interrupts, memory management, addressing modes, comparison of 8086 & 8085.

UNIT–III **[20%]**

Assembly language programming of 8085.

Assembly language programming of 8086, jumps, flags, and conditional jumps, branching and looping, strings, procedures, and macros, assembler directives, interrupts.

UNIT–IV **[20%]**

Introduction to Intel 80286 microprocessor, internal architecture, pin configuration, special instruction sets & their usage, memory management, advantage.

Intel 80386 microprocessor & Intel 80486 microprocessor, internal architecture, pin configuration, special instruction & their usage, memory management, advantage.

UNIT–V **[20%]**

Introduction to microcontrollers, interfacing, 8155 IO, 8279 Keyboard, 8255A, 8259A, 8237 DMA.

BOOKS:

1. Gaonkar, ***Microprocessor Architecture, Programming & Applications with 8085,*** PRI
2. Liu & Gibson , ***Microcomputer System, The 8086 Family***, PHI
3. Brey, ***The Intel Microprocessors***, Pearson Edunation

3. IMAGE PROCESSING

UNIT–I **[20%]**

Image acquisition, image model, sampling, quantization, relationship between pixels, distance measures, connectivity, image geometry, photographic film.

Basics of histogram, decision of contrast basing on histogram, histogram based operations, histogram equalization.

Fourier transform, DFT, FFT, properties, Walsh transform, WFT, Hadamard transform.

UNIT–II **[20%]**

Arithmetic & logical operations, operations on pixel, smoothing filters, mean, median, mode filters.

Edge enhancement filters, contrast based edge enhancement techniques, low pass filters, high pass filters, sharpening filters, comparative study.

Design of low pass, high pass, edge enhancement, smoothening filters in frequency domain.

Basics of color image processing.

UNIT–III **[20%]**

Introduction to image compression, run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization compression at the time of image transmission, image compression standards.

UNIT–IV **[20%]**

Introduction to image segmentation, characteristics of segmentation, detection of discontinuities, thresholding, pixel based segmentation method, region based segmentation methods, segmentation by pixel aggregation, segmentation by sub region aggregation, histogram based segmentation, spilt and merge technique, use of motion in segmentation.

UNIT–IV **[20%]**

Introduction to morphology, dilation, erosion, opening, closing, hit-and-miss transform, boundary extraction, region filling, connected components, thinning, thickening, skeletons, pruning, applications of morphology in ip.

Reference Book:

1. Gonzalez & Woods, ***Digital Image Processing*** , Addision Wesley
2. Arthur Weeks, ***Fundamentals of Electronic Image Processing***, PHI

Elective – II : Internet Technology Group

4. Cryptography and Network Security
5.Mobile Computing
6.Internet & E - Commerce

4. CRYPTOGRAPHY AND NETWORK SECURITY

UNIT–I **[20%]**

Introduction to security, attacks, services, mechanisms, security attacks, security services, model for network security, internet standards

UNIT–II **[20%]**

Conventional encryption principles, conventional encryption algorithms, message confidentiality, cipher block modes of operations, location of encryption devices, key distribution

UNIT–III **[20%]**

Introduction to public key cryptography, approaches to message authentication, secure hash functions, HMAC, public key cryptography principles, public key cryptography algorithms, digital signatures, key management

UNIT–IV **[20%]**

Authentication, e mail security, Kerberos, x.509 directory authentication services, PGP, S/MIME.

Overview of IP security, IP security architecture, authentication header, encapsulating security pay load, combing security associations, key management.

UNIT–V **[20%]**

Introduction to web security, web security requirements, SSL & transport layer security, SET network management security.

Basics of system security, intruders, viruses-related threats, firewalls, design principles, trusted systems

REFERENCE BOOKS:

1. William Stallings, ***Network Security Essentials Applications and Standards***, Pearson Education

2. Kaufman, ***Network Security: Private Communication in a Public World***, Pearson Education
3. William Stallings, ***Cryptography and Network Security***, Pearson Education.

5. MOBILE COMPUTING

UNIT–I **[20%]**

Introduction to personal communications services (PCS), PCS architecture, mobility management, networks signaling.

Overview of Global system for mobile communication (GSM) system, GSM architecture, mobility management, network signaling.

Overview of general packet radio services (GPRS), GPRS architecture, GPRS network nodes.

Basics of mobile data communication, WLAN (wireless LAN) IEEE 802.11 standard, mobile IP.

UNIT–II **[20%]**

Wireless application protocol (WAP), mobile internet standard, WAP gateway & protocols, wireless mark up languages (WML), WML script.

Introduction to wireless local loop(WLL), WLL architecture, wireless local loop technologies.

UNIT–III **[20%]**

Basics of third generation (3G) mobile services, introduction to international mobile telecommunications 2000 (IMT 2000) vision, wideband code division multiple access (W-CDMA), and CDMA 2000, quality of services in 3G.

UNIT–IV **[20%]**

Global mobile satellite systems, case studies of the IRIDIUM & GLOBALSTAR systems.

Wireless enterprise networks, introduction to virtual networks, blue tooth technology, blue tooth protocols.

UNIT–V **[20%]**

Support for mobility, file system consistency, world wide web, hypertext transfer protocol, hypertext markup language, some approaches that might help wireless access,

system architectures, wireless application protocol & its architecture, wireless datagram protocol, wireless transport layer security, wireless transaction protocol, wireless session protocol, wireless application environment, wireless telephony application, examples stacks with WAP, mobile databases, mobile agents

Reference Books:

1. Jochen Schiller, ***Mobile Communications***, Addison wisely

2. Wiiliam Stallings, ***Wireless Communications and Networks***.

3. Rappaort, ***Wireless Communications Principals and Practices***.

6. INTERNET & E-COMMERCE

UNIT–I **[20%]**

Review of computer communications and networks, OSI model, local area networks, wide area networks.

Introduction to internet, evaluation of internet, internet applications, TCP/IP, introduction to RFC, addressing in internet, IP & domains, internet service providers, types of connectivity such as dial-up, leased, VSAT, internet server and clients module in various operating systems.

UNIT–II **[20%]**

e-mail and list-servers, e-mail networks, e-mail protocols (x.400, smtp, uucp), format of an e-mail message, description of e-mail headers, e-mail contents and encoding, e-mail routing, list-servers, e-mail clients, pop-3, imap-4.

File transfer protocol, introduction to ftp, public domain software, types of ftp servers, ftp clients, common commands.

Telnet protocol, server daemon, telnet clients, terminal emulation.

UNIT–III **[20%]**

Usenet and internet relay chart, introduction to world wide web, evolution of www, basics features, www browsers, www servers, HTTP & URLs.

www browsers, basic features, bookmarks, history, progress indicators, personalization of browsers, printing displayed pages and forms, saving and downloads.

Basics of web publishing, technology overview, web site planning, where to host your web site, multiple sites on one server, maintaining a web site, publishing tools.

Introduction to HTML, document overview, header elements, section headings, block-oriented elements, lists, inline elements, visual markup, hypertext links, uniform resource locators (urls), images, forms, tables, special characters.

UNIT–IV **[20%]**

interactivity tools, cgi, activex, vbscript, javascript, php, java.

multimedia and graphics, vrml

Basics of search engines: technology overview, poplar search engines, how to register a web site on search engines.

internet security: overview of internet security threats, firewalls, introduction to aaa.

UNIT–V **[20%]**

Introduction to e-commerce, payment methodology, security aspects, standard in electronic payment, e-commerce and banking, e-commerce and retailing.

Elective – III : Soft Computing Group

7.Neural Network
8.Pattern Recognition
9.Fuzzy Logic & GA

7. NEURAL NETWORK

UNIT–I **[20%]**

Introduction: biological neurons, McCulloch-Pitts models of neuron, types of activation function, network architectures, knowledge representation.

Introduction to learning, error-correction learning, supervised learning, unsupervised learning, learning rules.

UNIT–II **[20%]**

Introduction to single layer perceptron, perceptron convergence theorem, method of steepest descent, least mean square algorithms.

UNIT–III **[20%]**

Introduction to multilayer perceptron, derivation of the back-propagation algorithm, issues in back-propagation, learning factors.

UNIT–IV **[20%]**

Introduction to radial basis & recurrent neural networks, RBF network structure, separability of patterns, RBF learning strategies, k-means and LMS algorithms, comparison of RBF and MLP networks,

Introduction to Hopfield networks, energy function, spurious states, error performance.

UNIT–V **[20%]**

Introduction to simulated annealing, the Boltzmann machine, Boltzmann learning rule, bidirectional associative memory, ant colony optimization, particle swarm optimization.

REFERENCE BOOKS:

Simon Haykin, ***Neural Network, A Comprehensive Foundation***, Pearson Education

2. Zurada J.M., ***Introduction to Artificial Neural Systems***, Jaico publishers

8. PATTERN RECOGNITION

UNIT–I **[20%]**

Introduction to pattern recognition, idea of pattern, machine perception, pattern recognition systems, design cycle, learning and adaptation.

Bayesian decision theory, continuous features.

UNIT–II **[20%]**

Maximum-likelihood, estimation of maximum likelihood, Bayesian estimation, Bayesian parameter estimation, Gaussian case and general theory, problems of dimensionality, Markov model, hidden Markov model

Idea of nonparametric models, density estimation, parzen windows, k-nearest-neighbor estimation, nearest-neighbor rule, nearest-neighbor classification.

UNIT–III **[20%]**

Linear discriminant functions, decision surfaces, generalized linear discriminant functions, 2-category linearly separable case, minimizing the perceptron criterion function, relaxation procedure, non-separable behavior, minimum squared error procedure, Ho-Kashyap procedures, multi-category generalizations

Introduction to nonmetric methods, decision tree, cart, ID3, C4.5, grammatical methods, grammatical interfaces.

UNIT–IV **[20%]**

Algorithm independent machine learning, lack of inherent superiority of any classifier, bias and variance, resampling for estimating statistic, resampling for classifier design, estimating and comparing classifiers, combining classifiers.

UNIT–V **[20%]**

Introduction to clustering, unsupervised learning, aspects of clustering, mixture densities and identifiability, maximum-likelihood estimations, application to normal mixtures, unsupervised bayesian learning, data description and clustering criterion function for clustering, different types of clustering, clustering algorithms.

Reference Books:

1. Duda, Hart, and Stock, ***Pattern Classification***, John Wiley and Sons.
2. Gose, Johnsonbaugh and Jost, ***Pattern Recognition and Image analysis***, PHI

9. FUZZY LOGIC & GA

UNIT–I **[20%]**

Overview of classical & fuzzy sets, membership function, fuzzy rule generation.

Operations on fuzzy sets, compliment, intersections, unions, combinations of operations, aggregation operations.

UNIT–II **[20%]**

Fuzzy arithmetic, fuzzy numbers, linguistic variables, arithmetic operations on intervals & numbers, lattice of fuzzy numbers, fuzzy equations.

UNIT–III **[20%]**

Introduction to fuzzy logic, basics of classical logic, multi valued fuzzy logics, fuzzy propositions, fuzzy qualifiers, and linguistic hedges.

UNIT–IV **[20%]**

Uncertainty based information, information & uncertainty, non-specificity of fuzzy & crisp sets, fuzziness of fuzzy sets, introduction of neuro-fuzzy systems, architecture of neuro-fuzzy networks, application of fuzzy logic.

UNIT–V **[20%]**

Introduction to Genetic Algorithm, architecture, GA in problem solving, implementation of GA, GA operators, variations of genetic algorithm.

1. G.J. Klir & B. Yuan, ***Fuzzy Sets & Fuzzy Logic***, PHI
2. Melanie Mitchell, ***An Introduction to Genetic Algorithm***, PHI

Elective – IV : Scientific Computing Group

10. Numerical and Statistical Algorithms

11. Computer Graphics and Multimedia
12. Optimization Technique

10. NUMERICAL AND STATISTICAL ALGORITHMS

UNIT–I **[20%]**

Iterative methods, zeros of transcendental equations and zeros of polynomials using bisection method, Newton–Raphson method, regula-falsi, convergence of solution.

Solution of simultaneous linear equations, Gauss elimination method and pivoting, ill-conditioned equations and refinement of solutions, Gauss-Siedal iterative method.

UNIT–II **[20%]**

Introduction to interpolation, difference table, polynomial interpolation, Newton, Lagrange, piecewise polynomial and spline interpolation.

Introduction to approximation, approximation of functions by Taylor series and Tchebysheff polynomials.

UNIT–III **[20%]**

Numerical differentiation & integration, classical formula for equality spaced abscissa, Simpson's 1/3 rule, trapezoidal rule with interval halving techniques, Romberg integration, Gauss quadrature, Monte-Carlo method for multidimensional integrals.

Solution of differential equations, ordinary first order differential equations, difference equation, single & multistape methods, Runge-Kutta method, predictor-corrector methods, automatic error monitoring, and stability of solutions.

UNIT–IV **[20%]**

Graphical representation of statistical data, frequency distribution, measures of central tendency and dispersion, random variable and it's expectation and variance.

Probability models, binomial, Poisson and normal.

Bivariate frequency distributions, scatter diagram, product moment, correlation coefficient and its properties, regression lines, correlation index and correlation ratio, rank correlation.

UNIT–V **[20%]**

Multiple linear regressions, multiple correlation, partial correlation.

Random sampling (with replacement and without replacement), expectations and standard error of sampling mean, expectation & standard error of sampling proportions.

Point of estimation of parameters, maximum likelihood estimation, interval estimation of parameters, test of significance based on t, f, and chi square distribution.

arge sample tests, tests based on Pearsonian frequency chi-square.

REFERENCE BOOKS:

1. William H. Press et al, ***Numerical Recipes in C – The art of Scientific computing*** , Cambridge Univ. Press
2. John R. Rice, ***Numerical Methods, Software and analysis***, McGrew Hill
3. Goon, Gupta and Dasgupta, ***Fundamentals of Statistics***.

11. COMPUTER GRAPHICS AND MULTIMEDIA

UNIT–I **[20%]**

Overview of computer graphics, definitions, types of computer graphics, applications of computer graphics, displays technologies, CRT technologies, raster scan display, random scan display, hardcopy output technologies, color basics, color display technologies, graphics input devices, joystick, light pen, digitizing tables, mouse, touch panels, image scanners graphics software.

UNIT–II **[20%]**

Points & lines, line drawing algorithms, DDA line drawing algorithm, Bresenham's line drawing algorithm, circle generation algorithms, midpoint algorithm, Bresenham's circle drawing algorithm, ellipse generating algorithm, scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

UNIT–III **[20%]**

Basic two dimensional transformations, translation, rotation, scaling, pivoting, repositioning problem, matrix representations & homogeneous coordinates, transformations between coordinate systems, reflection, shear, transformation of points, lines, parallel lines, intersecting lines.

Introduction to two dimensional viewing, viewing pipeline, basic definitions, window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygon clipping.

UNIT–III **[20%]**

Basics of 3D, curve representation, surfaces, Bezier curves, b-spline curves, end conditions for periodic b-spline curves, rational b-spline curves.

Introduction to 3D transformations, translation, rotation, scaling, rotation about an arbitrary axis in space, reflection through an arbitrary plane, general parallel projection transformation, clipping, viewport clipping, 3d viewing, perspectives & depth cueing.

Basics of hidden surface, depth comparison, z-buffer algorithm, back face detection, hidden line elimination, wire frame methods.

UNIT–III **[20%]**

Introduction to multimedia, concepts, uses of multimedia, hypertext and hypermedia, image, video & audio standards.

Basics of audio, digital audio, MIDI, processing sound, sampling, compression.

Basics of video, MPEG compression standards, compression through spatial & temporal redundancy, inter-frame and intra-frame compression .

Introduction to animation, types, techniques, morphing.

REFERENCE BOOKS:

1. Hearn & Baker, ***Computer Graphics***, Pearson.
2. Z. Xiang, R. Plastock, ***Schaum's outlines Computer Graphics***, TMH
3. Buford, ***Multimedia Systems***, Pearson Education

12. OPTIMIZATION TECHNIQUE

UNIT–I **[20%]**

Introduction to linear programming, mathematical formulation of linear programming, graphical analysis, simplex method of linear programming problems.

UNIT–II **[20%]**

Integer programming, dynamic programming, non-linear programming, quadratic programming.

UNIT–III **[20%]**

Basics of game theory, Min-Max principle, LPP methods, algebraic methods.

Transportation problems, assignment problems, sequencing problems.

UNIT–IV **[20%]**

Introduction to queuing theory, queue disciplines, pure birth process, pure death process, FCFS, M/M/1, M/M/N queues, Monte-Carlo simulation.

UNIT–V **[20%]**

Inventory control models, purchasing model, manufacturing model, EOQ system of ordering, multi-item deterministic model, stochastic models, purchase inventory model with price breaks (effect of quantity discount).

Network scheduling, PERT/CPM.

REFERENCE BOOKS:

1. Taha, ***Operations Research, an Introduction***, PHI
2. J.K.Sharma, ***Operations Research (Theory and Application)***, McMillan
3. N.D.Vohra, ***Quantitative Techniques in Management***, TMH
4. Kanti Swarup, P.K.Gupta, Man Mohan, ***Operations Research***, Sultan Chand & Sons.