# Department of Computer Science & Application
## Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C. G.)
**Five Years Integrated B.Sc./M.Sc.(Computer Science)**
**Scheme and Syllabus**

**SEMESTER: I**

| Course Code | Course Name | L | P /T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 101 | Business Communication | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 102 | Mathemat s-I | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 103 | Digital logic and Switching Theory | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 104 | Information Technology | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 105 | Programming in C | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS106 | Programming in C Lab | - | 3 | 3 | | 50 | 50 |

**Abbreviation Used- L: Lecture, P: Practical, T: Tutorial, C: Credit**

# MCS 101: BUSINESS COMMUNICATION

**Unit-I Fundamental of Communication:** Definition, Importance, Process, Form of Communication, Dimension of Communication, Channels of Communication, Barriers of Communication, Qualities of a good communicator.

**Unit-II Verbal and Non-Verbal Communication:** Audio/Visual Communication, Effective Speaking, Interpersonal Communication, Non-Verbal Communication: Kinesics, Proximics, Paralanguage, Activity: Short Classroom presentation.

**Unit-III Listening Skill and Self Assessment:** Definition and Importance, Intelligent Listening, Barriers of Listening and qualities of overcoming barriers, SWOT analysis.

**Unit-IV Writing Skills:** Use of Grammars, brief description & detailed Illustrations, Business correspondence, Presentations, Report Writing, Projects, notice and Circulars.

**Unit-V** Effective Use of Communication Skills(Practical Approach) Basics of Phonetics, Presentation Skill-Do's and Dont's, Extempore, Debate, Role Plays, Interview, Group Discussion.

**Text/ References Books**

1. P K Agrawal and AK Mishra, Business Communication, Sahitya Bhawan Publication.

2. Vinod Mishra and Narendra Sukla, Business Communication, SBPD Publishing House.

3. N Gupta and P Mahajan, Business Communication, Sahitya Bhawan Publication.

# MCS 102: MATHEMATICS-I

**UNIT-I**

Logic and Propositional Calculus: Introduction, Basic Logical Operations: Conjunction, Disjunction, Negation, Conditional and Bi-conditional statements, Tautology, Contradiction, Logical Equivalence, algebra of Propositions, Argument, Predicate, Quantifiers, Law of duality

**UNIT-II**

Set Theory: Introduction, Universal and Empty set, cardinality of set, Power set, Cartesian Product, Subset, Venn diagram, Set operation, Inclusion and exclusion principle

**UNIT-III**

Relation: Introduction, Properties of Binary Relation, Equivalence Relation, Relation Matrix, Relation Graph, Composition of Relation, Partition, Partial Order Relation, Hasse diagram

Function: Introduction, Onto function, Into function, One to One function, Bijective Function, Composition of Function, Inverse of Function

**UNIT-IV**

Graph- Definition, Finite and Infinite Graph, Incidence and Degree, Matrix Representation: Adjacency Matrix, incidence Matrix; Digraph. Isomorphic Graph, Homeomorphic Graph, Connected , Disconnected and strongly connected graph, Sub Graph, Walk, Path , Circuit, Complement of Graph, Regular Graph, Complete Graph, Weighted Graph, Bipartite Graph, Operations on Graph: Union, Intersection and Ring Sum; Application of Graph

**UNIT-V**

Cut set, cut Vertex,  Eccentricity, Centre , Radius and diameter of a Graph, Depth First Search, Breadth First Search, Dijkstra's Algorithm

**TEXT BOOK**
1.    "Discrete Mathematical structures with Applications to Computer Science", JP Trembly and R. Manohar, TMH International Edition (Latest Edition)
2.    "Graph theory and its application to Engineering and Computer Science", Narsing Deo, PHI (Latest Edition)
3.    "Advanced Discrete Mathematics" H.K. Pathak, J.P.Chauhan, Shiksha Sahitya Prakashan

**REFERENCE BOOK**
1.  "Discrete Mathematics", Seymour Lipshutz & Marc Lipson, TMH
2.  "Discrete Mathematics and Its Applications", Kenneth. H. Rosen, TMH
3.  "Discrete Mathematics with Graph Theory" Goodaire and Parmenter, EEE.

# MCS 103: DIGITAL LOGIC AND SWITCHING THEORY

**UNIT-I:**

Number Systems & Codes:Philosophy of number systems, Decimal, Binary, Octal, Hexadecimal, Gray code, Excess-3 code , BCD code. Conversion, number system arithmetic, complements (n-1's and n's), Signed and Unsigned numbers, representation of negative numbers.

**UNIT-II:**

Boolean Algebra, Fundamental postulates of Boolean algebra, Logic gates: OR, AND, NOT, XOR, Universal (NOR and NAND) Gates.

Minimization of Switching Functions: Standard representation of logic function (SOP and POS), Minimization technique- K Map method, Prime implicants, don't care combinations.

**UNIT-III:**

**COMBINATIONAL LOGIC DESIGN:** Design using conventional logic gates, Adder, Subtractor, Encoder, Decoder , Multiplexer (MUX), De-Multiplexer, MUX Realization of switching functions, Code-converters (BCD-EXCESS-3), Hazards and Hazard free realizations.

**UNIT-IV:**

**SEQUENTIAL CIRCUITS:** Definition, Basic flip-flops- SR, JK, T and D, Master Slave Flip Flop, race around condition, Steps in synchronous sequential circuit design: Register, modulo-N counter , Ring counter & Shift counters.

**UNIT-V**

Main memory, semiconductor memory, Flash memory, cache memory, magnetic memory: hard disk, floppy disk, optical memory.

**TEXTBOOKS:**
1. "Computer Fundamentals Architecture and Organization", B.Ram, New Age Techno Press.
2. "Digital Design", Morris Mano, PHI, 3$^{rd}$ Edition, 2006.

**REFERENCE BOOKS:**
1. An Engineering Approach To Digital Design – Fletcher, PHI.
2. Digital Logic – Application and Design – John M. Yarbrough, Thomson
3. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
4. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006.
5. Malvino A.P, Digital Principles and Applications, Tata McGraw Hill.
6. Computer Fundamentals: Architecture and Organization

# MCS 104: INFORMATION TECHNOLOGY

### UNIT-I

Introduction – Basic concept of IT, concept of data and information, History of computer, generation and classification of computer, organization of computers, Input and output devices, storage devices, data and file organization.

### UNIT-II

Software and its need, types of software: system software, application software, utility software, firmare. Operating system :Types, job and objective. Language translator. Introduction and evolution of programming language , Types of programming language, Generation of programming languages, programming paradigms: procedural oriented and object oriented programming

### UNIT-III:

Communication and network technology: Communication process, Communication and system elements, Analog and digital signal, mode of communication, communication media : wired and wirelesss; computer network: types. Criteria, advantages and disadvantages, Topology, OSI reference model and TCP/IP model

### UNIT-IV

Internet: Technical foundation of internet , history of internet, Internet service provider(ISP), ARPANET, Services available on Internet, Internet application : Email, WWW, and file transfer , Internet addressing, Domain name system(DNS), Internet security- Firewall , Encryption.

### UNIT-V

Application of IT and latest IT trends : IT in business, Industry, home, education, entertainment, science and engineering and medicine. Ecommerce , M-commerce

Latest IT trends : Artificial intelligence, Data mining, Overview of geographic information system(GIS) , Cloud computing, Big Data.

### TEXTBOOKS:
1. "Fundamental of computer ", V. Rajaraman, PHI Publication
2. "Introduction to information technology",  V. Rajaraman, PHI Publication
3. "Information Technology today" , S. jaiswal
4. "Fundamental of IT", Leon and Leon , Leon Tec world
5. "Introduction to Information Technology", Aksoy and Denardis, Cengage learning

# MCS 105: PROGRAMMING IN C

**UNIT-I**

**COMPUTER FUNDAMENTALS, INTRODUCTION TO C:**The C character set, identifiers and keywords, data types, constants, variables and array declaration, expressions, statements, symbolic constants.
**OPERATORS:** Arithmetic, Relational, Logical, Conditional, Bitwise, COMMA operator etc., library functions, data input/output, preparing and running complete C program.

**UNIT-II**

**CONTROL STATEMENTS:** preliminaries, if-else, nested if- else, goto statements, switch, break, continue, while, do-while, for, nested loops.
**ARRAYS:** Definition, array declaration and assignments, processing an array, passing arrays to a function, multi dimensional arrays.

**UNIT-III**

**FUNCTIONS:**A brief overview, defining a function, accessing a function, passing arguments to a function, specifying arguments data types, function prototypes, recursion. Program structure, storage classes, automatic variables, external variables, static variables.

**STRING:** Introduction, Operation function: strlen(), strcmp(), stricmp(), strncmp(), strincmp(), strcpy(), strcat(), strrev() and their implementation.

**UNIT-IV**

**POINTERS:** Fundamental, pointer declarations, passing pointers to a function, operations on pointers, pointer to pointer, array of pointers, dynamic memory allocation, preprocessor, macro expansion:#define, macro v/s function, file inclusion:#include.

**UNIT-V**

**STRUCTURES AND UNIONS:** user define data types, defining a structure, accessing structure elements, structure pointer, passing structure to a function, self referential structure, union and enumeration.

**TEXT/REFERENCES BOOKS:**
1.       "Programming with C", E. Balaguruswamy, TMH (Latest Edition)
2.       "Exploring C", Yashavant P. Kanetkar, BPB, (Latest Edition)
3.       "Understanding Pointers in C", Yashavant P. Kanetkar, BPB, (Latest Edition)
4.       "Programming with C", Gottfried, Schaum's Outline Series (Latest Edition)
5.       "Programming with C",  Rajaraman R, PHI (Latest Edition)
6.       "Programming with ANSI C",  B.T. Holmes, BPB (Latest Edition)
7.       "The C Programming Language", Kernighan & Ritchie, PHI (Latest Edition)

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**SEMESTER: II**

| Course Code | Course Name | L | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 201 | Computer Organization & Architecture | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 202 | Mathematics-II | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 203 | Microprocessor and Assembly Language Programming | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 204 | Environment Study | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 205 | Object Oriented Programming with C++ | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 206 | Programming in  C++ Lab | - | 3 | 3 | - | 50 | 50 |

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# MCS 201: COMUTER ORGANIZATION AND ARCHITECTURE

**UNIT-I**

**Computer Organization:** Introduction, Von Neumann Architecture, Harvard Architecture, Functional Units and Components in Computer Organization, Program Development Tools, Machine Language, Assembly Language, Instruction Codes, Computer Registers, Computer Instructions, Instruction cycle.

**UNIT-II**

**Central Processing Unit:** Stack organization, Instruction formats, Addressing modes, DATA Transfer and manipulation, Program control, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC).

**UNIT-III**

**Pipeline & Vector Processing:** Basic Concepts in Pipelining, speed-up, throughput, efficiency, instruction pipeline, Instruction Pre-fetch and Branch Handling , Data Buffering, Internal Forwarding, Data Dependant Hazards.

**UNIT-IV**

**The Memory System:** Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware.

**UNIT-V**

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Memory mapped I/O, Input –Output Processor (IOP).

**TEXT BOOKS:**
1. "Computer System Architecture", M.Moris Mano, 3$^{rd}$ Edition, PHI / Pearson, 2006.
2. "Computer Organization and Architecture", William Stallings 7$^{th}$ Edition, PHI/Pearson, 2006.

**REFERENCE BOOKS:**
1. "Computer Organization", Car Hamacher, Zvonks Vranesic & Safwat Zaky, 5$^{th}$ Edition, TMH, 2002.
2. "Computer Architecture and Organization", John P. Hayes, TMH International Editions, 1998.
3. "Computer Architecture and Organization", Raj Kamal, Nicholas Carter, 2$^{nd}$ Edition, TMH Education, 2009
4. "Introduction to computer architecture", Stones S. Galgotia Publication
5. "Computer Organization and Architecture design for Performance", 4$^{th}$ edition - W. Stallings, PHI
6. "Computer Engineering - Hardware Design", M. Morris Mano, PHI
7. "Computer Architecture and parallel processing", Kai Hwang & Faye Briggs, McGraw hill, 1985

# MCS 202: MATHEMATICS-II

**UNIT–I**

Errors and precision, errors due to round off, Solution of Algebraic and Transcendental Equations, Bisection Method, Method of False Position, Newton-Raphson Method.

**UNIT-II**

**Interpolation:** Introduction, Newton's Backward Interpolation formula, Newton's Forward Interpolation formula, Gausses forward Interpolation Formula, Gausses Backward Interpolation formula, Lagrange's Interpolation formula, Newton divided difference formula.

**UNIT–III**

**Curve Fitting:** Graphical method, Laws reducible to the linear laws, Principal of least square, Method of least squares, fitting a curve of type $y = a+bx^2$, $y = ax+bx^2$ , $y=ax+b/x$, $y= ax^2+bx$, $y=ax^b$, $y=ae^{bx}$, $xy^a=b$, Method of group averages

**UNIT-IV**

**Numerical Differentiation-** Forward Difference formula, Backward Difference formula, Numerical Integration : Quadrature formulae , Errors in Quadrature formulae, Rombergs Method, Euler –Maclaurin formula.

**UNIT–V**

**Numerical solution of Ordinary Differential equations**: Picards method, Taylors series method, Eulers method, Modified Eulers method, Runges method, Runge-kutta method

**TEXT /REFERENCE BOOKS:**
1. "Numerical Analysis", S.S. Sastry, PHI
2. "Numerical Method in Engineering and Science", Dr. B.S. Grewal, Khanna Publishers,2010
3. "Computer Oriented Numerical Methods", Rajaraman, PHI
4. "Numerical Computations", Venkataraman
5. "Computer Oriented Numerical Methods", Stoer, Bullrich, Springer Verlag, 1980

# MCS-203 MICROPROCESSOR AND ASSEMBLY LANGUAGE PROGRAMMING

## UNIT-1

Fundamental definition of Microprocessor, evolution of Microprocessor, Microprocessor Instruction set and Computer Languages, From large scale to single chip microcontrollers, Von Neumann and Harvard architecture, RISC vs. CISC, Application: Microprocessor Controlled Temperature System.

## UNIT-2

Register organization of 8086, Architecture, signal description of 8086, Physical memory organization , General Bus operation, I/O addressing capability, Special processor activities, Minimum mode 8086 system and timings, Maximum Mode 8086 system and timings, The processor 8088.

## UNIT-3

8086/8088 instruction set and assembler directives: Machine language instruction format, Addressing mode of 8086, Instruction set of 8086/8088, Assembler directives and operators.

## UNIT-4

Assembly language programming Examples, Machine coding programs

Special architectural features: stack structure of 8086/8088, interrupt and interrupt services routine , interrupt cycle of 8086/8088, Non maskable interrupt, Maskable interrupt.

## UNIT-5

Case study of Intel i series of processors.

**TEXT BOOKS:**
   1. "Advanced microprocessor and Peripherals", A .K. Ray and K.M.Bhurchandi, TMH, 2000.
   2. "Micro Controllers", Deshmukh, TMH.
   3. "Microprocessors Architecture, Programming and Applications", Ramesh S. Goanker, Wiley Eastern, 1994 or (Latest Edition)

**REFERENCE BOOKS:**
   1.  "Micro Processors & Interfacing", Douglas U. Hall, 2007."The 8088 and 8086 Micro Processors", 4th Edition, PHI, 2003.
   2.  "Micro Computer System 8086/8088 Family Architecture, Programming and Design", Liu and GA Gibson, 2nd Edition, PHI
   3.  "Introduction to Microprocessors", Aditya P. Mathur, TMH, 1995

# MCS 205: OBJECT ORIENTED PROGRAMMING WITH C++

**UNIT-I**

Introduction, Procedure-Oriented Programming paradigm, Object-Oriented Programming paradigm, Procedure oriented Vs Object oriented, basic characteristics of OOP's: object, class, encapsulation, inheritance, reusability, polymorphism and overloading, static and dynamic binding, message passing, benefits of OOP's and application of OOP's.

**UNIT-II**

C++ Basics: Overview, Environment Setup, Basic Syntax, Comments, Basic Data types, Tokens, identifiers, Keywords, Constants/Literals, Variables, Variable Scope, Modifier Types, Storage Classes, Operator, array, pointer and reference variable, I/O statements, namespace, typecasting, control statements: if statement, if- else statement, nested if-else statement, ladder if-else, switch statement, for loop statement, while loop statement, do-while loop statement.

**UNIT-III**

Objects and classes : Basics of object and class and abstract class in C++, private and public members, static data and function members, function prototype, inline functions, function overloading, friend functions, default arguments, constructors and their types, destructors, friend class, dynamic allocation operator new and delete.

**UNIT-IV**

Inheritance: Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class, resolving ambiguity.

Polymorphism: Pointers in C++, Pointes to objects, this pointer, virtual class, virtual and pure virtual functions.

**UNIT-V**

I/O Files and Streams: Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, File stream, C++ File stream classes, File management functions(read(), write(), put(), get(),tellg() tellp(), seekg() seekp()).

**TEXT/REFERENCE BOOKS:**
1. "Object-Oriented Programming with C++", E. Balaguruswamy, TMH
2. "C++ The Complete Reference", Herbert Shildt, Osborne,TMH, latest
3. "Object-oriented programming with C++", Robert Lafore, Macmillan computer
4. "Tech yourself C++", Herbert Schildt, Osborne, TMH
5. "C & C++ Complete reference", Herbert Shieldt, Osborne, TMH
6. "Object-Oriented programming in C++", Nabajyoti Barkakati, PHI
7. "C++ Primer Plus", Stephen Prata, Galgotia Publications, 1996
8. "Object-Oriented analysis and Design with applications", Grady Booch

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**Scheme and Syllabus**
**2014-15**

### SEMESTER: III

| Course Code | Course Name | L | P /T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 301 | Data structure using c and C++ | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 302 | Mathematics-III | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 303 | Operating System | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 304 | Data Communication and networking | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 305 | Data Structure& Operating System Lab | - | 5 | 5 | 25 | 75 | 100 |

**Abbreviation Used- L: Lecture, P: Practical, T: Tutorial, C: Credit**

# MCS 301: DATA STRUCTURE USING C AND C++

## UNIT 1

Introduction of Data structure, Data types: primitive, non-primitive data types, ADT, Linear and non linear data structure.

List Structures: Arrays: One dimensional, Multidimensional arrays, allocation methods, address calculations, sparse arrays. Linked List: Singly and Doubly Linear link lists, singly and doubly circular linked list: Definitions, operations (INSERT, DELETE, TRAVERSE) on these list. (Insertion operation includes – insertion before a given element, insertion after a given element, insertion at given position, insertion in sorted linked list)

## UNIT 2

**STACKS:** Stack: Definition, Operations PUSH, POP, TRAVERSE, implementations using array and linked list, Applications of stack: Infix, Prefix, Postfix representation and conversion using stack, Postfix expression evaluation using stack.

**QUEUES:** Introduction, and Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations (INSERT, DELETE, TRAVERSE), implementation using array and linked list and applications

## UNIT 3

Definition of trees and their types, Binary trees, Properties of Binary trees and Implementation operation (Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal), Binary Search Trees, Implementations, Threaded trees, AVL Trees, Balanced multi way search trees: 2-3 tree, Red Black tree, B tree, B+ tree, their applications

## UNIT 4

**SORTING:** Types of sorting, Sequential Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix sort.
**SEARCHING**: Linear search, Binary search, Hashing, collision resolution methods.

## UNIT 5:

Definition of Graph and their types, adjacency and incident (matrix & linked list) representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Shortest path Algorithm, spanning tree, Minimum Spanning tree, Kruskal and prims algorithms.

**TEXT/REFERENCE BOOKS:**
1. "Data structures using C", Tenenbum, PHI, 1996
2. "Fundamentals of Data Structures", Horowitz and Sahani, Computer Science Press, 1978
3. "Data structures and Algorithms", Aefred V. Aho, Jhon E. Joperoft and J.E. Ullman.
4. "An Introduction to Data Structures with Applications", Jean Paul Trembley and Paul Sorenson, TMH, International Student Edition, 1985
5. "Data Structures and Program Design in C", R. Kurse, Leung & Tondo, 2$^{nd}$ Edition, PHI publication

# MCS 302: MATHEMATICS-III

## UNIT-1

Matrix Theory: Definition, Type of Matrix, Elementary row and column operations on a matrix, Rank of matrix – Normal form – Inverse of a matrix using elementary operations , Eigen Value and Eigen Vector, - Characteristic roots and vectors of a matrix - Caley-Hamillton theorem and its applications.

## UNIT-2

Successive differentiation, Leibnitz Theorem and applications, Taylor's and Maclaurin's series, curvature, asymptotes, curve tracing.

## UNIT-3

Functions of two or more variables, partial derivatives, total differential and differentiability, derivatives of composite and implicit functions, Jacobians, higher order partial derivatives, homogeneous functions, Euler's Theorem and applications.

## UNIT-4

Probability and Distribution – Definition, set notation of probability, Addition & Multiplication law of probability, Bayes theorem, Discrete & continuous probability distribution, Binomial distribution, Poisson Distribution and Normal Distribution.

## UNIT-5

Sampling and Inference- Sampling Distribution, Testing of Hypothesis, Students t distribution, Chi-square Test, F Distribution, Fishers z Distribution.


**TEXT/REFERENCE BOOKS:**
1. Higher engineering Mathematics, B.S. Garewal, Khanna Publishers

# MCS 303: OPERATING SYSTEM

### UNIT-I: INTRODUCTION
Introduction: Definition, Computer-System Architecture, Types of Operating System, Micro Kernel and Monolithic Operating System, Special-Purpose Systems, Operating-System Operations, Computing Environments, operating system services, User Operating System Interface, System Calls and their types.

### UNIT-II: PROCESS MANAGEMENT
CPU Scheduling: concepts, scheduling criteria, scheduling algorithms.

Inter-process communication, Mutual exclusion problem and critical section. Process synchronization, Classical IPC problems: Producer Consumer problem, Dinning Philosophers problem, semaphores.

Deadlock: Necessary Conditions, deadlock handling methods: Deadlock Prevention, Deadlock detection and recovery, Deadlock avoidance, Bankers Algorithm.

### UNIT-III: MEMORY
Memory Management: Background, Swapping, Contiguous Memory allocation, Paging, Segmentation.

Virtual Memory Background, Demand Paging, Page Replacement, Thrashing.

### UNIT-IV: FILE MANAGEMENT
File System Implementation, File Concept, Access Methods, Directory Structure, File Sharing, Protection. File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-space Management, Recovery.

### UNIT-V: I/O MANAGEMENT
I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, Disk Structure, Disk Scheduling, Disk Management.

### TEXT/REFERENCE BOOKS:
1. "An Introduction to Operating Systems", H. M. Dietal, Addition Wesley
2. "Modern Operating Systems", Andrew S Tanenbaum.
3. "Operating System Concepts", 2nd Edition - Peterson & Silberschatz, Addison Wesely
4. "Operating Systems",  Mardrick and Donovan, Mcgraw Hill
5. "Principles of Operating Systems", Ullman, Galgotia Publications.
6. "Operating System Concepts", Galvino & Silberschatz, Addison Wesely,( Latest Edition)

# MCS- 304 DATA COMMUNICATION AND NETWORKING

**UNIT-I OVERVIEW OF DATA COMMUNICATION AND NETWORKING:**

**DATA COMMUNICATIONS:** components, data representation, direction of data flow (simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN),

**INTERNET:** brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

**UNIT-II PHYSICAL LEVEL:**

**ANALOG & DIGITAL TRANSMISSION**: transmission Impairments, Data Rates Limits, Digital to Digital Conversion, Line coding Scheme,

**ANALOG TO DIGITAL CONVERSION:** PCM, PAM, Delta Modulation, Transmission Modes, Parallel, Serials Asynchronous and Synchronous Communication

**DIGITAL TO ANALOG CONVERSION:** ASK, FSK, PSK, QPSK Constellation Diagram, QAM
**ANALOG TO ANALOG CONVERSION:** AM, FM, PM, Bandwidth Utilization, Multiplexing: FDM, WDM and TDM
Switching

**TRANSMISSION MEDIA:** Guided Media: Twisted Pair, Coaxial and Fiber Optic, Unguided Media: Wireless, Radio Waves, Microwaves and Infrared

**UNIT-III DATA LINK LAYER:**

**FLOW CONTROL:** Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;
**MEDIUM ACCESS SUB LAYER:** Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration;

**MULTIPLE ACCESS PROTOCOLS:** Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fast Ethernet.

**UNIT-IV NETWORK LAYER:**

**INTERNETWORKING & DEVICES:** Repeaters, Hubs, Bridges, Switches, Router, Gateway;
**ADDRESSING:** Internet address, classful address, subnetting, classless address
**ROUTING:** techniques, static vs. dynamic routing, and routing table for classful address

**ROUTING ALGORITHMS:** shortest path algorithm, flooding, distance vector routing, link state routing
**PROTOCOLS:** ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

**UNIT-V TRANSPORT LAYER AND APPLICATION LAYER:**

**PROCESS TO PROCESS DELIVERY:** UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos DNS; SMTP, SNMP, FTP, HTTP, Firewalls.

**MODERN TOPICS:** Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

**TEXT BOOKS:**
1. "Data Communications and Networking", B. A. Forouzan, TMH, (Latest Edition)
2. "Computer Networks", A. S. Tanenbaum, 4$^{th}$ Edition, Pearson Education/PHI
3. "Data and Computer Communications", W. Stallings, 5th Edition, PHI/ Pearson Education

**REFERENCE BOOKS:**
1. "Computer Networking -A top down approach featuring the internet", Kurose and Rose, Pearson Education
2. "Communication Networks", Walrand, TMH (Latest Edition)
3. "Internetworking with TCP/IP, vol. 1, 2, 3", Daglous E. Comer, 4$^{th}$ Edition Pearson Education/PHI

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**Scheme and Syllabus**

### SEMESTER: IV

| Course Code | Course Name | L | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 401 | Introduction to Java | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 402 | Operation Research | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 403 | System Analysis and Design | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 404 | Database Management System | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 405 | Java and DBMS Lab | - | 5 | 5 | 25 | 75 | 100 |

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# MCS-401 INTRODUCTION TO JAVA

**UNIT-1**

**Overview of JAVA :** The genesis of java, An overview of java, Java virtual machine (JVM) ,Java development kit (JDK) ,Java Vs C++, Data types, Literals, Variables, and Arrays, Operators, Control statements.

**UNIT-II**

**Introducing Class:** Class fundamentals, Closer look at Methods and class ,Nested and inner class ,Exploring Java.lang, String handling ,Constructor ,this keyword, Garbage collection and finalize() method. Writing simple JAVA program.

**UNIT-III**

**Inheritance**: Basics ,Types of inheritance ,Access specifier ,using super, method overriding ,Abstract class ,constructor in multilevel inheritance ,using final with inheritance ,Dynamic method dispatch ,Abstract class ,

**UNIT-IV**

**Package and Interface:** Defining package, CLASSPATH, Access protection ,Importing package ,Defining and implementing interface ,Variable in interface ,Extending interface, Nested interface.

**UNIT-V**

**Exception handling and Multithreading:** Using try and catch ,multiple catch classes, Nested try statements , throw ,throws and finally ,Built in exception ,Uncaught exception , Creating own exception class , Java Thread Model: Main thread ,Creating own Thread ,Life cycle of thread, Thread priorities ,Synchronization and messaging, Interthread communication ,Suspending ,Resuming and stopping thread.


**TEXT/REFERENCE BOOK**

1. Java: The complete reference By Naughton P and schildt H. ,Osborne Tata Mcgraw-Hill. 2. Java Programming By E.Balguruswami
3. Core JAVA for beginners By Rashmi Kanta Das ,Vikas Publication.
4. Core JAVA : A Comprehensive Study by Mahesh P. Matha , PHI publication.

# MCS 402: OPERATION RESEARCH

## UNIT-I

**Introduction to Operations Research**: Introduction and History, Definition and concept, Characteristics or significant features of Operations research, General methods for solving Operations Research Models, Phases of Operations Research methods, Scope, Shortcomings, Applications, Techniques.

## UNIT-II

**Linear Programming:** Introduction, Salient features of Linear programming (Terminology), Advantages, Limitations, Applications, Formulation of linear programming model, Simplex method.

## UNIT-III

**Transportation Problems:** Introduction, North West Corner Method, Vogel's Approximation Method, Optimality test: Stepping stone method and MODI method.

## UNIT-IV

**Assignment Models:** Introduction, mathematical formulation of the problem, Hungarian method, Sample Problems, Special case in assignment.

## UNIT-V

**Sequencing Problems:** Introduction, general sequencing formula, Processing n jobs through two machines, Processing n jobs through three machines, Processing n jobs through m machines.

**TEXT BOOKS:**
1. Manohar Mahajan, "Operations Research", Dhanpat Rai & Co., 2013.
2. P. Sankara Iyer, "Operations Research", Tata McGraw-Hill, 2008.
3. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

**REFERENCE BOOKS:**
1. J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.
3. J K Sharma., "Operations Research, Problems and Solutions, 3e", Macmillan India Ltd.
4. N.V.S. Raju, "Operations Research", HI-TECH, 2002.

# MCS-403: SYSTEM ANALYSIS AND DESIGN

**UNIT-I**

**THE SYSTEM CONCEPT;** Elements of a system, types of system. Introduction to system development life cycle, Recognition of need, prototyping.

**UNIT-II**

Introduction to system analysis, determining the users information requirements, problem definition, Background analysis, fact-finding, fact analysis.

Introduction to structured analysis, the tools of structured analysis, Feasibility study; oral representation, Data analysis, Cost/ Benefit analysis

**UNIT-III**

**INTRODUCTION TO SYSTEM DESIGNS:** The Process and stages of Systems Design, Design methodology, structured design, structured walkthrough, Major development activities, Data validation, Introduction Input/output and forms Design

**UNIT-IV**

**INTRODUCTION TO SYSTEM TESTING:** The Test Plan, Quality assurance, Post implementation review, Software maintenance, Procedure for Hardware/Software selection

**UNIT-V**

Project Management and Control, Project Control, Gantt Chart, PERT and CPM, System Security.

**TEXT BOOKS:**
1.      System Analysis and Design, Elias. M. Awad, Galgotia Publication.

**REFERENCE BOOKS:**
1.      Kendall and Kendall, System analysis and Design, PHI.
2.      Igor Hawryszkiewycz, Introduction to System analysis and Design, PHI

# MCS 404: DATA BASE MANAGEMENT SYSTEM

**UNIT-1**

**Introductory Concepts:** Introduction, Instance and schema, View of Database system, Database languages, Data Base architecture, Database Administrator

**UNIT-2**

**Database Design and ER- Model –** Introduction, Entity, Relationship, Attributes, Constraints, ER Diagram, Reduction to Relational Schema, Specialization, Generalization, Aggregation.

**UNIT-3**

**Relational Database Design:** Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Comparison of BCNF and 3NF, Closure of set of functional Dependency, Closure of Attribute Sets, Canonical Cover, Lossless Decomposition, Dependency Preservation

**UNIT-4**

**Relational Database-**Structure of Relational Database, Schema, Keys, Relational Operation- Selection, Projection, Natural Join, Cartesian Production, Union, Intersection and Minus operation

**UNIT-5**

**SQL-** Basic Data Types, Create Table, Drop Table Alter Table, Queries on Multiple Relation, Join Operation, String Operation, Set Operation, Grouping, Nested Sub queries

**TEXT/REFERENCE BOOKS:**
1. "Fundamentals of Database System", R. Elmasri & S. Navathe
2. "Data Base Management System", Henry F. Korth & Abraham Silberschats, TMH, 1991.
3. "An Introduction to Database Management System", Vol I &II, Date C.J., Addison Wesley, 1981, 1983

# Department of Computer Science & Application
## Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C. G.)
**Five Years Integrated B.Sc./M.Sc.(Computer Science)**
**Scheme and Syllabus**

**SEMESTER: V**

| Course Code | Course Name | L | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 501 | Theory of Computation | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 502 | Web Technology | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 503 | Software Engineering | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 504 | Artificial Intelligence and Expert system | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 505 | Web Technology Lab | - | 5 | 5 | 25 | 75 | 100 |

**Abbreviation Used- L: Lecture, P: Practical, T: Tutorial, C: Credit**

# MCS 501: THEORY OF COMPUTATION

## UNIT I:

Sets, Relations and Functions, Fundamental Proof Techniques, Introduction of alphabets, Strings and Languages; Automata, Finite automata (FA), Transition System & Function and their properties; Deterministic Finite Automata (DFA) -Formal definition, simplified notations (state transition diagram, transition table), Non-deterministic Finite Automata (NFA -Formal Definition, Acceptability of a String by a DFA & NFA,), Minimizing number of state of a DFA, Finite Automata with output (Moore and Mealy Machine, Procedure for Transforming a Mealy Machine into a Moore Machine and vice versa

## UNIT-2

**FORMAL LANGUAGES:** Definition of a Grammar, Derivations and the Language Generated by a Grammar, Chomsky Classification of Languages, Languages and Their Relation, Recursive and Recursively Enumerable Sets, Operations on Languages, Languages and Automata

## UNIT 3:

Regular expressions (RE)- Definition, FA and RE, Transition System Containing A-moves, NFAs with A-moves and Regular Expressions, NFA to DFA conversion, Algebraic Method Using Arden's Theorem, Construction of Finite Automata Equivalent to a Regular Expression and vice versa, Equivalence of two FA, Equivalence of two RE, Pumping Lemma for Regular Sets, Application of Pumping Lemma, Closure Properties of Regular Sets, Regular Sets and Regular Grammars, Closure Properties of Regular languages, emptiness, finiteness, membership.

## UNIT 4:

Context-free Grammars (CFGs)-Formal definition, sentential forms, leftmost and rightmost derivations, The language of CFG, Derivation tree, Ambiguity in grammars and Languages, Ambiguity in CFG, Simplification of CFG, Normal Forms for CFG (Chomsky Normal Form, Greibach Normal Form), Pumping Lemma for Context-free Languages, Closure Properties of CFG's

## UNIT 5:

Pushdown Automata (PDA):Formal definition, acceptance by PDA, PDAs and CFGs, CFG to PDA, PDA to CFG, DPDAs -Definition, DPDAs and Regular Languages, DPDAs, and CFLs, Languages of DPDAs, DPDAs.

Context Sensitive Grammar, Linear Bounded Automata, Turing Machines -Formal definition and behaviour, Transition diagrams, acceptance by TM, Multi tape Turing Machine, Universal Turing Machine, Halting Problem of Turing Machine

## TEXT/REFERENCE BOOKS:

1. "Elements of The Theory of Computation", H.R.Lewis & C.H. Papadimitriou, P.H.I.
2. "Introduction To Automata Theory, Language and Computation" J.E.Hopcroft, R.Motwani J.D.Ullman, Pearson Education
3. "Theory of Computer Science(Automata, Languages And Computation)", K.L.P.Mishra, N.Chandrasekaran:,PHI
4. "Introduction to languages and Theory of Computation", John Martin, McGraw Hill
5. "Introduction To Computer Theory", D.A.Cohen (J.Wiley)

# MCS 502: WEB TECHNOLOGY

**UNIT-1**
**WEB BASICS** : What is web, Characteristics of good web design, URL, Web Browser, WWW, Web Server ,HTTP, search engine, Tools for web site creation.

**UNIT-2**
**HTML/DHTML** :Introduction , Elements, Attributes, Headings, Paragraphs, Styles Formatting, Quotations, Comments , Hyper-Links, Images, Tables, Lists, Frames, Forms, Input Types, Input Attributes

**UNIT-3**
**CSS :** Introduction, Syntax, measurement units, colors, Backgrounds, Font, Text, position, Align, Images, Link, Table, List, Padding, Cursor, Rounded corner, Borders, Multi Background

**UNIT-4**
**JAVASCRIPT**: Overview, syntax, Enabling Java script, Variables, Operators, Decision control statement: If-else, Switch Case; Looping statement: while loop, for loop, for..in Loop

**UNIT-5**
JavaScript functions, events, Cookies, Page Redirect, Dialog Boxes, Page printing, Error handling, Validation, Debugging, Image Map,
XML: Introduction to XML, Difference between XML and HTML

**TEXT/REFRENCE BOOKS:**
1. "Internet and Internet Engineering", Daniel Minoli, TMH (Latest Edition)
2. "Java Script",  Gosslin, Vikas (Latest Edition)
3. "HTML The Definite Guide", Chuckmusiano & Bill Kenndy,  O Reilly (Latest Edition)
4.  "Dynamic HTML", Joseph Schmuller, BPB, 2000.

# MS 503: SOFTWARE ENGINEERING

## UNIT I
**Introduction to Software Engineering:** Definition, Evolution, Principles, Exploratory style of software development, Need of software engineering, Emergence of software engineering, Computer systems engineering.

## UNIT II
**Software Life Cycle Models:** Definition, Classical Waterfall model, Iterative Waterfall model, V-model, Prototyping model, Incremental development model, Evolutionary model, Rapid Application Development(RAD), Agile model, Extreme programming model, Spiral model.

## UNIT III
**Software Project Management (SPM):** SPM complexities, responsibilities of a software project manager, project planning, metrics for project size estimation, project estimation techniques, COCOMO model, Scheduling: Work breakdown structure, Activity networks, Critical Path Method (CPM), PERT, risk management, software configuration management.

## UNIT IV
**Requirements Analysis and Specification:** Requirements gathering, requirements analysis, Software Requirements Specification (SRS): Users of SRS Document, Need of SRS, Characteristics of SRS Document, functional requirements, non-functional requirements, goals of implementation; **Software Design:** Characteristics, Outcome of the Design process, Cohesion and Coupling, Approaches to software design, Data Flow Diagram (DFD), Data dictionary.

## UNIT V
**Coding and Testing:** Coding standards and guidelines, code review, software documentation, Testing: Basic concepts and terminologies, verification, validation, testing process, unit testing, black-box testing, white-box testing, Control flow graph, cyclomatic complexity, mutation testing, debugging, integration testing, system testing.

**TEXT/ REFERENCE BOOKS**:

1. "Fundamentals of Software Engineering", Rajib Mall, PHI
2. "Software Engineering, A Practitioner's Approach", Roger Pressman", 4th Edition, TMH.
2. "Software Engineering", P.S.Pressman, TMH
3. "An Integrated Approach of Software Engineering", Pankaj Jalote, Galgotia
4. "Software Engineering", M.Shooman, TMH

# MCS-504 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM

**UNIT -I**

**Introduction:** Overview of Artificial Intelligence (AI), Foundations of A.I., History of AI, Areas and state of the art in A.I. ,Knowledge: Introduction ,Knowledge Based system ,Knowledge representation techniques.

**UNIT II**

**A.I. Programming languages –**Introduction to LISP ,Basic list manipulation functions, Input/output and local variables, Lists and Arrays, simple program in LISP , Introduction to PROLOG.

**UNIT III**

**Problems and Heuristic Search Techniques:** Problem solving as state space search, production system, control strategies and problem characteristics; Search techniques: Breadth First , Depth-first search, Hill-climbing, Heuristics search, Best-First search.

**UNIT IV**

**Knowledge Representation** – Approaches and Issues ,Frame, Conceptual dependency , Semantic Net ,Scripts etc. ,Propositional Logic , First order , Propositional Logic (FOPL), Conversion to clausal form, Inference rules, Resolution principal.

**UNIT V**

**Expert System**- Introduction ,Application ,Existing Expert systems. Components of typical expert system ,Rule based system architecture,

**TEXT/REFRENCE BOOKS**

1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems , PHI Publication.
2. Elaine Rich and Kevin Knight , Artificial Intelligence ,TMH publication.
3. V.S. Jankiraman ,K. Sarukesi and P.Gopalakrishnan ,Foundations of Artificial Intelligence and Expert Systems , Macmillan Series in Computer Science.

# Department of Computer Science & Application
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**Five Years Integrated B.Sc./M.Sc.(Computer Science)**
**Scheme and Syllabus**

<u>**SEMESTER: VI**</u>

| Course Code | Course Name | L | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 601 | Introduction to Artificial Neural Networks | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 602 | Computer Graphics | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 603 | ASP.NET | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 604 | Major Project | - | - | - | - | 200 | 200 |

**Abbreviation Used- L: Lecture, P: Practical, T: Tutorial, C: Credit**

# MCS-601 - INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

## UNIT-1

Introduction: History, Definition and meaning, Different areas of Artificial Intelligence, Applications, Essence and benefits of neural networks.

## UNIT-2

Basic Neural Network Model: Biological model, Artificial neuron Vs Biological neurons, Types of Neural Network, Model of an artificial Neuron, Activation function, Weights, bias, meaning of learning and training, Types of learning.

## UNIT-3

Neural network architecture: Single layer and multilayer perceptrons, transfer functions Training of a simple perceptron: Training of a single layer neural network with simple example like AND, OR logic gates.

## UNIT-4

Multilayer Neural Network: Types of Multi Layer Neural Network, Feed forward neural network, Delta learnig rule, Back propogation network, Error back propogation Algorithm.

## UNIT-5

Application of ANN: Application of ANN in various domains.

**Reference Books**
1. Neural Networks: A comprehensive Foundation (2e preferred): Simon Haykins, Prentice Hall of India.
2. Sivanadam and Deepa: Principal of Soft Computing, John wiley and sons.
3. Neural Networks for Pattern Recognition: Christopher M Bishop: Oxford Press
4. Introduction to Artificial Neural Systems:J.M.Zurada, West Publishing Company, St. Paul, Minnesota, 1992 / Jaico Publishing House, Bombay, 1994
5. K.Vinoth Kumar and R. Saravana Kumar, Neural Network and Fuzzy Logic, Katsoon Books.

# MCS 602: COMPUTER GRAPHICS

## UNIT-I

Introduction to Computer Graphics, Application of Graphics, Display Devices: Refresh Cathode-Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitors and Flat Panel Displays. Video cards/display cards. Graphic Software, Graphics Software Standard and Software Packages

## UNIT-II

**Line Generation Algorithms:** DDA algorithm, Bresenham's algorithm; **Circle Generation Algorithms:** Midpoint Circle algorithm

 **Polygon filling Algorithms:** Scan Line Polygon fill algorithm, Inside - Outside Tests, Boundary-Fill algorithm, Flood - Fill algorithm. Fundamentals of aliasing and Antialiasing Techniques.

## UNIT-III

**Two Dimensional Viewing:** Window to Viewport coordinates transformation.

**Clipping:** Clipping operations, Point clipping**, Line clipping:** Cohen Sutherland Algorithm, Liang Barsky Algorithm, Nicholl-Lee-Nicholl Algorithm, **Polygon clipping:** Sutherland- Hodgeman Algorithm, Weiler Atherton Algorithm,
**Text clipping, Exterior clipping**
**Two Dimensional Transformations:** Translation, Scaling, Rotation, Reflection, Shear

## UNIT IV

**Three Dimensional Viewing:** 3D Geometry, 3D display techniques, transformations. **Projections:** Parallel Projection, Perspective Projection. Orthogonal Projection
.

## UNIT V

**Color Models and Color Application:** Color Model, Standard Primaries and the Chromaticity Diagram, XYZ Color Model, CIE Chromaticity Diagram. RGB Color Model, YIQ Color Model, CMY Color Model, HSV Color Model. Conversion between HSV and RGB Models. HLS Color Model, Color Selection and Application.
**Case study of OpenGL**

**TEXT/REFERENCE BOOKS:**
1. "Principles of Interactive Computer Graphics", Newman, W. Sproul, R.F., TMH,1980
2. "Fundamentals of Interactive Computer Graphics", Foley J.D., Van Dome, Addison Wesley,1982
3. "Computer Graphics", Hearn D., Baker, PHI, 1986
4. "Procedural Elements for Computer Graphics", Rogers D. F., TMH, 1986
5. "Computer Graphics using OpenGL", F. S. Hill Jr., Pearson Education, 2003**.**

# MCS 603: ASP.NET using C#

**UNIT-I**

Evolution of Web Development, .NET framework, .NET languages, Common Language Runtime, .NET class library, ASP.NET: introduction and evolution

**UNIT-II**

C# language: Basic, variable and Data Types, math and type conversion operation, conditional statements, loop statements, Methods, class, object, static member, overloading, inheritance, constructor, events, partial class, namespace and assemblies

**UNIT-III**

Visual studio: Visual studio IDE, Code editor, Visual Studio Debugging, Creating Websites, Designing Web form, Anatomy of a Web Form, Writing Code, Visual Studio Debugging. Page class, Application events,ASP.NET configuration; Web controls: List Controls, Input Validation Controls, Master Page Basics, Website Navigation: Site Maps, TreeView Control, Menu Control

**UNIT IV**

Error Handling: Common Error, Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Logging Exceptions; ADO.NET Fundamentals: ADO.NET architecture, Connection class, Command class, Data reader class, DataSet, DataAdopter class, DataView class.
.
**UNIT V**

Data Binding: Basic Data Binding, Data Source Controls, SqlDataSource, ObjectDataSource; Rich Data Controls: GridView, Formatting the GridView, GridView Row Selection, Sorting the GridView, Paging the GridView, GridView Templates, ListView, DetailsView and FormView.

**TEXT/REFERENCE BOOKS:**
1. "Pro ASP.NET 4 in C# 2010", Matthew MacDonald, Apress
2. "ASP .NET 3.5 Website Programming Problem-Design -solution", Chris Love, Wiley Publication
3. "Beginning ASP.NET 4 in C# 2010 Matthew MacDonald, Apress
4. "Pro C# 5.0 and .Net 4.5 Framework", Andrew Troelson, Apress

# Department of Computer Science & Application
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**Five Years Integrated B.Sc./M.Sc.(Computer Science) and M.Sc. (Computer Science)**
**Scheme and Syllabus**

**SEMESTER: VII and  I**

| Course Code | Course Name | L | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 701 | Cryptography and Network Security | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 702 | Compiler Design | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 703 | Analysis and Design of Algorithms | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 704 | Advance Computing Technologies | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 705 | Analysis and Design of Algorithm Lab | - | 5 | 5 | 25 | 75 | 100 |

**Abbreviation Used- L: Lecture, P: Practical, T: Tutorial, C: Credit**

# MCS-701  - Network Security and Cryptography

## UNIT-I

**Classical Encryption Technique-** Basics of computer network, TCP/IP model, Foundations of Cryptography and security trends, Secret key Vs public key cryptography, Symmetric cipher model, substitution techniques, Transportation techniques, Mathematical tools for cryptography: modular arithmetic, Euclidean algorithm, finite fields, polynomial arithmetic.

## UNIT-II

**Symmetric cipher -**Symmetric cipher model, Traditional block cipher: Stream and block cipher, Feistel cipher network structure, Design Principles of Block Ciphers, Data Encryption Standard (DES), Strength of DES Triple DES, Block cipher design principal, Block cipher operation, Advance encryption Standard (AES), Evaluation criteria of AES,AES transformation function, key distribution.

## UNIT-III

**Public Key cryptography and Hash Function-** Principles of public key cryptosystem, requirement, RSA algorithm. Hash function, Key management: Diffie-Helman Key exchange, Man in the middle attack, elliptic curve arithmetic, elliptic curve cryptography, Application of cryptographic hash function, Hash and Message authentication Code (MAC), Hash and MAC algorithms, MAC based on hash function, Digital signature and Authentication protocol. Key management and distribution: Distribution of symmetric key and public key, Public key Infrastructure (PKI).

## UNIT-IV

 **IP and Web security protocols-**User authentication: principle, Remote user authentication using symmetric and asymmetric encryption, Kerberos, E-mail security: Pretty Good Privacy (PGP), S/MIME, IP security: IPsec, transport layer Security: Secure Socket layer (SSL), Secure Electronic Transaction (SET).

## UNIT-V

**System Security-** Firewall, Intrusion Detection and prevention system (IDPS), Malicious Software.

### Reference/Text Books
1. Cryptography and Network Security By William Stallings, 4th Edition Pearson Publication.
2. Network security and cryptography by Bernard Menezes, Cenage Learning India Pvt. Ltd. First edition 2010.
3. Applied cryptography - protocols and algorithm By Buce Schneier, Springer Verlag 2003.
4.  Cryptography and Network Security By Atul Kahate , TMH Publication.
5.  Cryptography and Network Security By Behrouz A. Forouzan, First Edition, TMH Publication.
6. Network Security: Private Communication in Public World By Charlie Kaufman ,Radia Perlman and Mike Speciner, PHI Publication.

# MCS-702  Compiler Design

## UNIT I
**Introduction**: Introduction to Compiler, Analysis of the source program, phases of compiler, cousins of compiler, grouping of phases, compiler construction tools. Lexical Analysis: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata, from regular expression to finite automata transition diagrams, Lex.

## UNIT II
**Syntax Analysis And Parsing Techniques**: Context free grammars, Bottom-up parsing and top down parsing. Top down Parsing : elimination of left recursion, recursive descent parsing, Predictive Parsing ,Bottom Up Parsing : Operator precedence parsing, LR parsers, Construction of SLR, canonical LR and LALR parsing tables, Construction of SLR parse tables for Ambiguous grammar, the parser generator – YACC.

## UNIT III
**Syntax Directed Translation & Intermediate Code Generation** : Synthesized and inherited attributes, dependency graph, Construction of syntax trees, bottom up and top down evaluation of attributes, S-attributed and L-attributed definitions ,Postfix notation; Three address codes, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expression and Procedure Calls.

## UNIT IV
**Runtime Environment**: Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation.

## UNIT V
**Code Optimization & Code Generation**: Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations. Issue in the design of Code generator, register allocation, the target machine, and simple Code generator.

**Text Books:**
1. Compilers-Principles, Techniques and Tools, Alfred V. Aho, Ravi Sethi and Ullman J.D., Addison Wesley, 2 nd Ed.
2. Principle of Compiler Design, Alfred V. Aho, and J.D. Ullman, Narosa Publication.

**Reference Books:**
1. Compiler design in C, A.C. Holub, PHI.
2. Compiler construction (Theory and Practice), A.Barret William and R.M. Bates, Galgotia Publication.
3. Compiler Design, Kakde.

# MCS-703 Analysis and Design of Algorithms

## UNIT -I

Introduction of Algorithm, Analysis of algorithms, asymptotic notations, Standard notations and common functions, Recurrence solution: Substitution method, iteration method and the master method, algorithm design techniques: basic

## UNIT -II

**DIVIDE AND CONQUER:** Binary search, Min-Max Problem, merge sort, quick sort, and Matrix Multiplication.

**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP-Completeness Problem, NP-Hard Problems

## UNIT -III

Graph Algorithms: Undirected Graph, Directed Graph, Traversing Graphs, Representation of graphs, Breadth-first search, Depth-first search, strongly connected components, topological sort.

**String Matching**: Introduction, The naïve string matching algorithm, Rabin-Karp algorithm, String Matching with finite automata.

## UNIT -IV

**GREEDY METHOD:** Knapsack problem, Huffman codes, job sequencing with deadlines, Minimum Spanning trees: Prim's and Kruskal's algorithms, Single Source Shortest path: Dijkstra's algorithm and Bellman Ford algorithms.

## UNIT -V

**DYNAMIC PROGRAMMING:** O/1 Knapsack problem, all Pair's shortest paths: Warshal's and Floyd's algorithms, Single source shortest paths, Backtracking, Branch and Bound: Travelling Salesman Problem.

**TEXT /REFERENCE BOOKS:**
1. "Introduction to Algorithms ", Thomas H. Cormen et al., PHI
2. "Fundamentals of computer algorithms", Ellis Horowitz, Sartraj Sahni and Rajasekaran, Galgotia
3. "Design Methods and Analysis of Algorithms", Prof S.K.Basu, BHU, PHI
4. "Data Structures,Algorithms and Applications in C++", Sahni, TMH
5. "Design and analysis of computer algorithms", Aho A.V, Hopcroft, J.E. Ullman, , Addision-wesley
6. "Fundamentals of Algorithmics", Brassard and Bratley, PHI
7. "Data Structure in C", Andrew.S.Tanenbaum, PHI

# MCS-704 Advance Computing Technologies

**Unit-I**

**Distributed System -** Introduction, Advantages of Distributed Systems over Centralized Systems, Distributed System architecture, Design Issues of Distributed Systems

**Unit-II**

Grid- Grid computing overview, Application, benefits and limitation, Basic Constituent Elements: Functional view, Physical View, Service view, Open Grid Service Architecture, Open Grid Services Infrastructure

**Unit-III**

**Cluster Computing-** Cluster computing overview, architecture, Application, benefits and limitation, Types of cluster, Cluster components, Programming environment and tools

**Unit-IV**

**Cloud Computing-** Cloud Computing Overview, Architecture, Applications, Benefits & Limitations of Cloud Computing, Cloud Computing Models including Infrastructure/Platform/Software – as-a-service, Public cloud, private cloud and hybrid clouds, Cloud OS, Performance measure of cloud: Scalability, Performance, QoS.

**Unit-V**

**Advance computing trends:** DNA Computing, Quantum Computing, Parallel Computing, Ubiquitous Computing, Context aware computing, Fog computing, now computing, Internet of Thing

**Reference/Text Books**

1. Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGrawHill.
2. Grid Computing, Joshy Joseph and Craig Fellenstein, Pearson Education 2004.
3. The Grid Core Technologies, Maozhen Li, Mark Baker, John Wiley and Sons , 2005.
4. Beowulf Cluster Computing with Linux, William Gropp, Ewing Lusk, Thomas Sterling, MIT Press, 2003.
5. Distributed and Cloud Computing, Kaittwang Geoffrey C.Fox and Jack J Dongrra, Elsevier India 2012

# Department of Computer Science & Application
## Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C. G.)
**Scheme and Syllabus**

**Five Years Integrated B.Sc./M.Sc.(Computer Science)/ M.Sc. (Computer Science)**

**VIII$^{th}$ Semester and II$^{nd}$ Semester**

| Course Code | Course Name | L | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 801 | Advanced Java | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 802 | Soft computing | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 803 | Advanced Database Management System | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 804 | Advanced Operating System | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 805 | Advanced Java Lab | - | 5 | 5 | 25 | 75 | 100 |

**Abbreviation: L- Lecture, P- Practical, T-Tutorial, C-Credit**

## MCS- 801 Advanced JAVA

**UNIT–I**
**Core Java:** History and Evolution of JAVA, Overview of JAVA, Java Magic, JDK and JRE, Java SE and EE, Different IDE for writing JAVA program like Eclipse, NetBeans etc. Primitive Data Types, Variables, Array, operators, control statement, classes and objects, Abstract Classes, Polymorphism, Inheritance, Method Overriding, Method Overloading, Constructors, Keyword super, this, final, static, Packages and Interfaces, Multi threading and Exception Handling.

**UNIT–II**
**JAVA Applet and Packages:** Applet class, Event Handling, AWT, Exploring JAVA Packages: java.lang, java.util, java.io.

**UNIT–III**
**Network-Socket Programming and JDBC:** Introduction to Collections, Java Serialization, Network Programming, Socket Programming, Socket for client and server, Processing E-Mails with Java: Protocols and Servers, Creating Mailer, Writing the Mail Sender.  Database Using JDBC: Concept, JDBC Driver Types, JDBC package, Establishing a database connection and executing SQL statements, Introduction to Swing, Introdction to Remote Method Invocation (RMI).

**UNIT–IV**
**Java Server Page (JSP):** Basics of Servlet, writing simple program in servlet,  Introduction to Java Server Page (JSP), Embedding Java Code into HTML, Implicit JSP Objects, Overview of the JSP Tags, Directives, Declarations, Expressions, Deploying Servlet and JSP, JSTL.

**UNIT–V**
**JAVA, XML and Advance API:**. Java and XML, XML syntax, Document type definition, Parsers, Simple API for XML (SAX), JAVA API for XML Processing (JAXP), Introduction, Types and  Benefits of EJB, EJB Containers, Deploying EJB, Introduction to the Java Persistence API, Overview of Spring, Model View Controller (MVC).Introduction to Struts, JavaFX and Hibernate.

**Text /Reference Books:**
1.  The Complete Reference JAVA, Herbert Schildt, Tata McGraw Hill publication, 5th Edition.
2.  Advance JAVA, Gajendra Gupta, Firewall Media, 1st Edition, 2006.
3.  JAVA network programming, Elliotte Rusty Harold, O'Reilly Publication, 3rd Edition.
4.  Core Java for Beginners, Rashmi Kanta Das, Vikas Publishing House Pvt. Ltd.
5.  JAVA in a Nutshell, David Flanagan, O'Reilly Publication, 5th  Edition.
6.  Learning JAVA, Patrik Niemeyer and Jonathan Knudsen, O'Reilly Publication, 3rd edition.
7.  Java Servlet and JSP Cookbook, Bruce W. Perry, O'Reilly Publication, 1st  Edition.
8.  Enterprise JAVA beans 3.1, Andrew Lee Rubinger and Bill Burke, O'Reilly Publication, 6th Edition.
9.  The Struts Frameworks: Practical guide for Java Programmers, Sue Spielman, Murgan Kaufmann publisher.

10. Programming Jakarta Struts, Chuck Cavaness, O'Reilly Publication, 1st Edition.
11. Spring and Hibernate, K.Santosh Kumar, McGraw Hill Education (India) Pvt. Limited, 2nd edition.
12. Introduction to Programming with JAVA – A Problem Solving Approach , John Dean, Raymond Dean, Tata Mc Graw Hill.
13. Java2, Swing, Servlets, JDBC and JAVA Beans Programming Black Book Steven Holzner, Dreamtech press.
14. Core and Advanced JAVA (Black Book), Dreamtech Press.
15. JAVA and XML: Solutions to real world problem, Justin Edelson, Brett McLaughlin, O'Reilly Publication, 6th Edition.

## MCS-802 Soft Computing

**UNIT–I**
**Introduction -**What is soft computing?. Different tools of soft computing and its comparison, Area of application.

**UNIT-II**
**Artificial Neural Network**(ANN) :Architecture, Introduction, Evolution of Neural Network, Biological Neural Network Vs ANN, Basic Model of ANN, Different types of ANN, Single layer Perceptron, Solving XOR problem, Activation function, Linear severability, Supervised and unsupervised learning, perceptron learning, delta learning, Feed-forward and Feedback networks, Error Back Propogation Network (EBPN), Associative memories and its types, Hopefield Network, Kohenen self organizing Map.

**UNIT-III**
**Fuzzy Logic -** Introduction to Classical Sets and Fuzzy Sets, Membership Function, properties and operations of classical set and Fuzzy set, a-cuts, Properties of a-cuts, Linguistic Variables, Membership function, Classical relation and Fuzzy Relation and its properties and operations, Defuzzification and its methods,  Fuzzy rule base.

**UNIT–IV**
**Genetic Algorithm -** What is Optimization?, Introduction, Application, GA operators: selection, crossover and mutation ,different techniques of selection ,crossover and mutation, different types of chromosomes, Application of GA.

**UNIT-V**
**Hybrid soft commuting**- Design of Neuro-Fuzzy model like ANFIS , Neuro-Genetic, Fuzzy-Genetic Neuro-Fuzzy-Genetic model, MATLAB environment for soft computing.


**Text/Reference Books:**
1. Principles of soft computing , S.N. Shivanandan and S.N Deepa , Wiley publication, Wiley India Edition.
2. Neural network and Learning Machines, Simon Haykin, Pearson Education, 2011. Artificial Neural Networks, Robert J. Scholkoff, Mc Graw Hill Education( India) Pvt. Limited,1997.
3. Neural Networks and Fuzzy Systems, A dynamical Systems Approach to Machine Learning,  Bart  Kosko, PHI learning private limited.
4.  Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rakasekaran, G.A. Vijayalakshmi Pai, PHI learning private limited, 14th Edition. 2003.
5. Neural Networks and Fuzzy Logic, K. Vinoth Kumar, R. Saravana Kumar, S. K. Kataraia and Sons publication.
6. Artificial Neural Networks, B.Yegnanarayana Prentice Halll of India (P) Limited.
7. Introduction to Artificial Neural Systems, Jacek M. Zurada, Jaico Publication House.
8. Fuzzy Sets, Uncertainty and Information, G. J. Klir and T.A. Folger, PHI learning private limited .

9. Fuzzy sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, PHI learning private limited .
10. Fuzzy Logic and Fuzzy Decision Making: Concepts and Applications, G. Kannan, Galgotia Publication.
11. Intelligent hybrid System : Neural Network, Fuzzy Logic and Genetic Algorithm by Da Ruan, Kluwer Academics publisher.
    Introduction to Neural Networks using MATLAB 6.0, S.N. Shivanandan, S. Sumathi and S.N Deepa, Mc Graw Hill Education( India) Pvt. Limited, 22$^{nd}$ Edition, 2015.
12. Genetic Algorithms: In search, Optimization and Machine Learning, David E. Goldberg, Pearson education, 15$^{th}$ Edition.
13. Multi Objective Optimization Using Evolutionary Algorithms, Kalyanmoy Deb, Wiley Publication, Wiley student Edition, 2013.

# MCS-803 Advanced Database Management System

**Unit-I**
**Basic Concepts:-** Definition of database, Schema and instance, Database architecture, File system Vs Database system, Types of Database system, Database languages, Basic SQL query statement, Triggers and Assertion.

**Unit-II**
**Database File Organization-** Introduction, Secondary storage devices, Buffering of blocks, Operation on files, Heap file, Sorted File, Hashing Techniques, RAID, B Tree, B+ Tree.

**Unit-III**
**Query processing and Optimization-** Translation of SQL queries to relational algebra, merge-sort algorithm for external sorting, Algorithm for select, Join, Project and set operation, Implementing aggregate function and Outer joins, Combining operation using pipelining, Heuristics in query optimization, Selectivity and cost estimates in query optimization.

**Unit- IV**
**Transaction**- Introduction, Desirable properties of transaction, Recoverability, Serializability, Locking, Two Phase locking, Timestamp Ordering.

**Recovery-** Concept, Recovery based on deferred update and immediate update, Shadow paging, ARIES recovery algorithm.

**Unit-V**
**Distributed Database**- Concepts, Types of Distributed Database, Advantages of Distributed Database, Architecture of Distributed Database, Data fragmentation, Replication, and Allocation techniques in Distributed Database.

**Text /Reference Books:**

1. R. Elmasri & S. Navathe, "Database Systems :Model, Language, Design and Application Programming",
   Pearson, 6th edition 2014,
2. Henry F. Korth & Abraham Silberschats , "Data Base Management System", TMH, 1991.
3. Date C.J., "An Introduction to Database Management System", Vol I &II, Addison Wesley, 1981, 1983
4. S. Ceri and G. Pelaggati , "Distributed Database Principles and System" , TMH, 1984

# MCS-804 Advanced Operating System

**Unit-I**
**Operating System Concepts:** Definition, Types of operating system, operating system services, system call, process concept, process synchronization, deadlock, necessary conditions for deadlock, deadlock avoidance, file system.

**Unit -II**
**Introduction to Distributed Systems:** Definition, goal, disadvantages of distributed system, hardware concepts: bus-based multiprocessor, switched multiprocessor, bus-based multicomputer, switched multicomputer; software concepts: network operating system, true distributed system, multiprocessor timesharing system; design issues.

**Unit -III**
**Communication in Distributed Systems:** Layered protocols, asynchronous transfer mode networks: Definition, ATM Physical layer, ATM Adaptation layer, ATM switching; Client-Server model: Clients and servers, addressing, blocking versus nonblocking primitives, buffered versus unbuffered primitives, reliable versus unreliable primitives; remote procedure call, group communication.

**Unit -IV**
**Synchronization in Distributed Systems:** Clock synchronization: logical clocks, physical clocks, clock synchronization algorithms; Mutual exclusion: centralized algorithm, distributed algorithm, token ring algorithm; Election Algorithm: Bully algorithm, ring algorithm; atomic transactions, deadlock in distributed system: detection and prevention.

**Unit -V**
**Processes and processors in Distributed Systems:** threads, system models, processor allocation, scheduling in distributed systems, fault tolerance.
**Distributed Shared memory:** Introduction, Shared memory: On-chip memory, bus-based multiprocessor, ring based multiprocessor, switched multiprocessor, NUMA multiprocessor.
**Case study:** Amoeba, MACH.

**Text /Reference Books:**
1. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education, 1995.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles" , John Wiley & Sons Inc., 2006.
3. Mukesh Singhal, Niranjan Shivaratri, "Advanced Concepts in Operating Systems", TMH,2001
4. William Stallings, "Operating Systems – Operating System: Internals and Design Principles", Prentice Hall, 2005.

# Department of Computer Science & Application
## Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C. G.)
**Scheme and Syllabus**

**Five Years Integrated B.Sc./M.Sc.(Computer Science)/  M.Sc. (Computer Science)**

**IX$^{th}$ Semester  and III$^{nd}$ Semester**

| Course Code | Course Name | T | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 901 | Ad-Hoc  Wireless Network | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 902 | Big Data Analytics | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 903 | Data warehousing and Data mining | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 904 (Elective) | (A) Graph Theory (B)  Image Processing (C) Pattern Recognition | 4 | 1 | 5 | 25 | 75 | 100 |
| MCS 905 | Data Mining Lab | - | 5 | 5 | 25 | 75 | 100 |

# MCS-901 Adhoc Wireless Network

## UNIT – 1
**Introduction:** Introduction to wireless Networks. Characteristics of Wireless channel, Ad hoc Networks: Introduction, Issues in Ad hoc wireless networks, Adhoc mobility models, applications.

## UNIT – 2
**MAC:** MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols, Contention based protocols with reservation mechanisms.

## UNIT –3
**MAC:** Contention-based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, IEEE standards: 802.11a, 802.11b, 802.11g, 802.15 and 802.16.

## UNIT – 4
**Routing** : Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Proactive routing protocol, Reactive Routing protocol, Hybrid routing protocol, Hierarchical routing protocols, Power aware routing protocols.

## UNIT – 5
Transport Layer: Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks.

**TEXT/REFERENCE BOOKS:**
1. "Ad hoc Wireless Networks – Architectures and
   Protocols', C. Siva Ram Murthy and B.S.Manoj, Pearson Education, 2004
2. "Wireless Sensor Networks", Feng Zhao and Leonidas Guibas, , Morgan Kaufman
   Publishers, 2004.
3. "Adhoc Mobile Wireless Networks", C.K.Toh, Pearson Education, 2002.
4. 'Wireless Mesh Networking'Thomas Krag and Sebastin Buettrich, , O'Reilly
   Publishers, 2007.

# MCS-902   BIG DATA ANALYTICS

## UNIT I – INTRODUCTION TO BIG DATA
Big Data and its importance, Characteristics of Big Data,  What Comes Under Big Data, Who's Generating Big Data, Challenges in Handling Big Data, How Big Data Impact on IT,  Big Data Analytics, Big data applications, Future of Big Data, Risks of Big Data.

## UNIT II – INTRODUCTION TO HADOOP
Introduction to Hadoop, Hadoop Architecture, Design Principles of Hadoop, Advantages of Hadoop, Hadoop Storage: Hadoop Distributed File System (HDFS),   Properties of HDFS,   NameNode, Secondary NameNode, DataNode, Goals of HDFS, Hadoop vs. Other Systems.

## UNIT III -HADOOP MapReduce
Hadoop MapReduce, MapReduce paradigm, Resource manager, Node manager, Partitioner, combiner.

## UNIT IV -YARN
Introduction to YARN, YARN Framework, Classic MapReduce Vs YARN, Schedulers: FIFO, Fair, Capacity.

## UNIT V- HADOOP Ecosystem
Spark, Hive, HBase, Pig, Sqoop, Oozie.


## TEXT/ REFERENCE BOOKS

1. "Professional Hadoop Solutions", Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley,  2015.
2. "Understanding Big data ", Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
3. "HADOOP: The definitive Guide" , Tom White, O Reilly 2012.
4. "Big Data Analytics with R and Haoop", Vignesh Prajapati, Packet Publishing 2013.
5. "Oracle Big Data Handbook", Tom Plunkett, Brian Macdonald et al , Oracle Press, 2014.
6. http://www.bigdatauniversity.com/
7. "Big Data and Business analytics",  Jy Liebowitz, CRC press, 2013.

# MCA-903 Data Mining and Data Warehousing

**UNIT-I**
**Introduction**
What is data mining, Why it is important ?, Mining on what kind of data, Data mining Functionalities, steps of data mining, Knowledge discovery.

**UNIT-II**
**Data Data Warehouse**
Meaning, definition, OLTP Vs. OLAP, Data warehouse architecture, Three Tier Architecture Data warehouse architecture, Data cube and OLAP technology

**UNIT-III**
**Association Rule**
Basic concept, Frequent item set mining: Apriori algorithm etc., Mining various kind of association rules: Mining Multilevel association rules, Mining multidimensional association rules

**UNIT-IV**
**Classification and prediction**
What is classification and prediction, Decision tree algorithms: CART,ID3 C4.5, CHAID , Baysian classification, Rule based classification, Classification by backpropogation, Support vectio machine, Association classification and other classification methods. Prediction using Regression and Neural Network methods, Accuracy measures, Ensemble methods.

**UNIT-V**
**Cluster analysis and Data mining Tools**
What is cluster analysis?,  Partitioning method, Hierarchical methods, Experiments with WEKA data mining tools for model development, data preprocessing, feature selection for Financial data, health care data etc.

**Text/Reference  Books**
1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishes (Elsevier, 2nd edition), 2006
2. Data Mining Methods for Knowledge Discovery , Cios, Pedrycz, Swiniarski,Kluwer Academic Publishers, London – 1998
3. Data mining techniques, Arun K Pujari, Universities Press (India) private limited, 2007.
4. Data Mining, Data Warehousing and OLAP, Gajendra Sharma, S.K. Kateria and Sons, 2010.

# MCS- 904(A) Digital Image Processing

**UNIT- I**
Digital Image Fundamentals and Transforms: Elements of visual perception, Image Sampling and quantization, Basic relationship between pixels, Basic geometric transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Traqnsform, Haar, Slant, Karhunen, Loeve transforms.

**UNIT- II**
Image Enhancement Techniques: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image Subtraction, Image Averaging, Spatial filtering: Smoothing, Sharpenning filters: Laplacian filters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering.

**UNIT- III**
Image Restoration: Model of Image Degradation/Restoration process, Noise models, inverse filtering, least mean square filtering, Constrained least mean square filtering, Blind image restoration, Pseudo inverse, Singular value decomposition.

**UNIT- IV**
Image Compression: Lossless compression: Variable length coding, LZW coding, Bit plane coding, predictive coding, DPCM. Lossy Compression: Transform coding, Wavelet coding, Basic of Image compression standards: JPEG, MPEG, Basic of Vector quantization.

**UNIT- V**
Image Segmentation and Representation; Edge detection, Thresholding, Region Based segmentation, Boundary Representation: Chair codes: Polygonal approximation, Boundary segments, boundary descriptors: Simple descriptors, Fourier descriptors, Regional descriptors, Simple descriptors, Texture

## TEXT/REFERENCE BOOKS

1. "Digital Image processing", R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd Education, 2003.
2. "Fundamentals of Digital Image processing", A.K.Jain , PHI.
3. " Digital Image processing using MAT LAB", Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.
4. "Digital Image Processing", William K. Pratt, John Wilely, 3rd Edition, 2004.
5. "Fundamentals of Electronic Image Processing", Weeks Jr., SPIC/IEEE Series, PHI.
6. "Image Processing Analysis and Machine Vision", Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999)
7. "Digital Image Processing and Applications",  Chanda Dutta Magundar, PHI, 2000

# MCS-904(B) Graph Theory

**UNIT -I**
Graphs, Sub graphs, some basic properties, various  example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, Euler graphs, various operation on graphs, Hamiltonian paths and circuits, the travelling sales man problem.

**UNIT- II**
Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, prim's algorithm, Kruskal algorithm and Dijkstra Algorithm.

**UNIT -III**
Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

**UNIT -IV**
Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix.

**UNIT -V**
Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem Discussion.

**REFERENCE/TEXT BOOKS**

1. Graph theory with applications to Engineering and Computer Science, Deo, N, PHI
2. Introduction to Graph Theory, Gary Chartrand and Ping Zhang, TMH
3. Introduction to Graph Theory,  Robin J. Wilson, Pearson Education
5. Graph theory and application., Bondy and Murthy, Addison Wesley.
6. Schaum's Outline of Graph Theory, V. Balakrishnan, TMH
7. Graph Theory: Modelling, Applications and Algorithms, Geir Agnarsson, Pearson Education

# MCA-904(C)  Pattern Recognition

**Unit-I**
Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

**Unit-II**
Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminate functions,

**Unit – III**
Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminate analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

**Unit - IV**
Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbour Estimation, Nearest Neighbour Rule, Fuzzy classification.

**Unit - V**
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

**Reference/Text Books**

1. "Pattern Classification", Richard O. Duda, Peter E. Hart and David G. Stork, , 2$^{nd}$ Edition, John Wiley, 2006.
2. "Pattern Recognition and Machine Learning", C. M. Bishop, Springer, 2009.
3. "Pattern Recognition".S. Theodoridis and K. Koutroumbas, , 4th Edition, Academic Press, 2009

# Department of Computer Science & Application
## Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C. G.)
**Scheme and Syllabus**

**Five Years Integrated B.Sc./M.Sc.(Computer Science)/ M.Sc. (Computer Science)**

**X<sup>th</sup> Semester and IV<sup>th</sup> Semester**

| Course Code | Course Name | T | P/T | C | Sessional Marks | End Semester Marks | Total Marks |
|---|---|---|---|---|---|---|---|
| MCS 1001 | Major Project | | | 25 | - | 500 | 500 |

## Important Guidelines for Major Project
A project report has to be submitted as per the rules described below:

1. **Number of Copies:** The student should submit One hard bound copy of the Project Report with one RW/CD/DVD.
2. **No of students:** Every student has to submit separate project.
3. **Acceptance / Rejection of Project Report:** The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.
4. **Format of the Project Report :**The student must adhere strictly to the following format for the submission of the Project Report
    I.    **Paper:** The report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The report to be submitted to the University must be original and subsequent copies may be photocopied on any paper.
    II.   **Typing:** The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons.
    III.  **Margins:** The typing must be done in the following margins
                    Left ----- 35mm, Right ----- 20mm
                    Top ----- 35mm, Bottom ----- 20mm
    IV.   **Binding:** The Report shall be Rexene bound in black. Plastic, spiral bound Project Reports not be accepted.
    V.    **Front Cover:** The front cover should contain the following details:

          **TOP :** The title in block capitals of 6mm to 15mm letters.
          **CENTER :** Full name in block capitals of 6mm to 10mm letters.
          **BOTTOM :** Name of the University, year of submission- all in block
          capitals of 6mm to 10mm letters on separate lines with proper spacing and
          centring.
    VI.   **Blank Sheets:** At the beginning and end of the report , two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

5. **Abstract:** Every report should have an abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.

6. **Certificates etc:** The report should contain the following:
   **i.** Certificate from Company
   **ii.** Institute Certificate: Successful completion of project by competent authority.
   **iii.** Acknowledgment
   **iv.** List of Figures
   **v.** Tables
   **vi.** Nomenclature and Abbreviations

7. **Contents of the Project Report:** The project report must contain following in form of chapter, however student may include any other relevant chapter(s):
   **i.** **Company Profile:** This chapter should highlight the company details. This would be chapter 1 and should include the main stream activity of the company, the product line of the company and the details of the department where the student has carried out his/her project work. This should not exceed two pages or 800 words.
   **ii.** **Introduction to the project:** This chapter shall highlight the purpose of project work, it will also define the chapters to be followed in the Project Report.
   **iii.** **Scope of work:** Brief scope of the project work done
   **iv.** **Existing System and Need for proposed System:** If there is some system already in use, then give brief detail of it in order to help to understand the enhancements carried out by the student in the existing system.
   **v.** **Operating Environment**: Hardware and Software required and used
   **vi.** **Proposed System:** Which may contain following**:**
      a. **Objectives to be fulfilled**: clearly define the objective(s) of the system.
      b. **User Requirements**: State the requirements of the use in an unambiguous manner.

      c. **Requirements Determination Techniques and Systems Analysis Methods Employed:** Use the formal methods to describe the requirements of the use like Fact Finding Methods, Decision Analysis, Data Flow Analysis etc.
      d. **Prototyping:** If the prototypes has been developed prior to the detailed design, then give details of the prototype.
      e. **System Feature**: Which includes as follows:
         - Module specifications
         - D.F.D. and ER
         - System flow charts
         - Data Dictionary
         - Structure charts
         - Database /File layouts
         - Design of Input Design of Output screens and reports
         - User Interfaces
         - Design of Control Procedures

8. **Testing procedures and Implementation phase**
9. **Problems encountered, Drawbacks and Limitations**