SYLLABUS

2016

DRIEMS School of Professional Studies

BCA

(Regular 3 Years Semester System Program)

Utkal University, Bhubaneswar

SYLLABUS(BCA)

MATHEMATICS - 1.1

UNIT-I : First order Differential Equations: Basic concepts, Separable equation & modeling, Exact differential equations, integrating factor, Linear differential equations & modeling, Orthogonal trajectories of curves.

UNIT-II : Second order Linear Differential Equations: Homogeneous linear equations, Homogeneous equation with constant coefficients & modeling. Differential operations, Euler-Cauchy equation, wronsnian Now-homogeneous equations, salutations by undetermined coefficients & variation of parameters, Modelling.

UNIT-III : Higher order Linear Differential equations : Homogeneous equations with constant coefficients, No homogeneous equations, methods undetermined Coefficients' and variation of parameters.

System of Differential Equations: Basic concepts, Homogeneous linear systems with constant coefficients phase plane, critical points, stability, phase plane method for nonlinear system.

UNIT-IV : Linier Algebra-I :Basic concepts, operation on matrices, linier system of equation, vector spaces, linier independence & basic, rank and inverse of a matrix ,Determinants ,linear transformation.

UNIT-V : Linier Algebra-II : Eigen value, Eigenvectors & application, Symmetric, skew-symmetric, Orthgonal, Hermitian, Skew-Hermitian and Unitary matrices, Diagenalization, Quadratic form and application to conic section.

BOOKS RECOMMENDED:

1. Erwin Kreyszig: Advanced Engineering Mathematics(7^{th} Edition) John wiley and sons .Chapters : 1(excluding 1.10& 1.11), 2 (excluding 2.13) ch 3,ch 4 (excluding 4.6) ch 7.

2. J. Sinharay & S. padhy –A course on ordinary and partial differential equations, Kalyani publishers (ch. 1,2,3)

3.V.krishnamurty,v.p.mainary, J. L. Arora-Linear Algebra, Affiliated East-Estpress.

Reference: 1.M.C.Potter, J. Goldberg- Mathematical Methods, Prentice Hall of India.

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BUSINESS PRACTICE - 1.2

UNIT-I : Nature and purpose of business, Classification of business activities, Industrial commerce & Trade, Objectives of business.

Forms of business organization: Sole proprietorship, partnership, joint-stock companies, co-operative societies (Meaning, Characteristics, Advantages, Disadvantages of each forms of organization).

UNIT-II : Joint Stock Companies: Types of companies, Registered companies, Statutory companies, Public company, Private company, Public enterprises, Shareholders' funds: Share capital, Type of shares, Reserves and surplus, Loan funds, Secured loans, Unsecured loans, Debentures, Public deposits.

UNIT-III : Trade: home trade, foreign trade.

Channels of distribution: Wholesaler and retailer, Meaning and characteristics storage and warehousing: Functions, Benefits and types.

UNIT-IV : Transport: Modes of transport, Land, Water and Air

Insurance: Principles of insurance, Re-insurance, Double insurance, Benefits of insurance.

UNIT-V : Financial institutions: Meanings and objectives

Commercial Banks: Objectives and functions

Reserve Bank of India: Objectives and functions.

BOOK RECOMMENDED:

1. Business Studies- Sharma & Gupta (Kalyani)
2. Business Organisation- C.L . Chaturvedi and L.N.Agarwal (Shree Mahavir Book Depot)
3. Principles of Business Organisation- S.P.Maheswari(Pitambari)

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DIGITAL ELECTRONICS - 1.3

UNIT – I : Logic circuits, Circuit analysis and design.

UNIT-II : Data Processing and arithmetic circuits.

UNIT – III : Principles, Registers and Counters

UNIT – IV : Switching circuits, logic families and Semiconductor memories.

UNIT – V : Clocks, Timers, D/A and A/D conversion.

BOOK RECOMMENDED :

1. D.P. Leach and A.P. Malvin: Digital Principles and applications: Mc-Grew Hill international Edition.

REFERENCES .

1. M. Mano: Digital Logic & computer Design (PHI)
2. R.P. Jain: Modern Digital Electronics, Tata Mc Grew Hill Publishing Co. Ltd.
3. R.K. Gaur Digital Electronics & Microcomputers, D.R. Publications.
4. Thomas Bartee: Digital Computer, Mc. Grew Hill.

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COMPUTER FUNDAMENTALS – 1.4

UNIT – I : Computer Basics & Data representation: Basic structure and functions of a computer, Elementary idea of algorithm and computer program, Concept of stored program execution, Characteristics of computer, Data representation in computer, Binary, octal and hexadecimal numbers and their interconversion, ASCII and EBCDIC codes, Boolean operations, Logic gates and truth tables.

UNIT – II : Memory & I/O Unit: Memory hierarchy, Serial access and Random access memory, Memory cell, Memory organization, Secondary storage: Hard disk, Floppy disk, CD ROM and magnetic tape, Description of various input and output devices.

UNIT- III : Computer Architecture, Operating System and Languages Interconnection of processor with other units, Structural components of CPU and their functions, Instruction Execution, Interrupt structure, Multiprogramming, Functions of operating system, Basic Knowledge of various types of operating system, Types of languages, Machine code, Assembly language, High-level languages, compiler and interpreter.

UNIT- IV : Evolution and Classification of Computers: First, second, third, fourth and fifth generation of computer, Microcomputer, Evolution of microcomputers, client-server computer system, Distributed computer system, parallel computer, Special purpose computers and their applications.

UNIT- V : Computer applications. Importance of information and use of computer for information processing, communication with and among computers, Goals of computer network, Internet and www. Network topologies, lobe area networks, Applications of computer to scientific research, Business applications, Industrial applications, Defense, Weather forecasting, Space applications, Use in law, medicine & education.

BOOKS RECOMMENDED:

1. V. Rajaraman : Fundamentals of computers, Prentice Hall of India. (Third Edition)
2. P.K. Sinha: Computer Fundamentals, BPB Publications

REFERENCES :

1. D.P. Curlin: K. Foley, K Sen and C. Morin: Information Technology, Mc Graw Hill Edition.
2. Roger Hunt and John Shelly: Computer and Commonsense, Prentice Hall of India
3. J.P. Hayes: Computer Architecture and organization) Mc. Graw Hill International Edition)

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PROGRAMMING TECHNIQUE USING 'C' – 1. 5

UNIT – I : Introduction to problem solving: Problem solving aspect, Top-Down design, Implementation of algorithms, Program Verification, Efficiency of algorithms Analysis of algorithms.

UNIT – II : Types, Operator, Expression and Control Flow : Variables names, Data types and sizes, Constants, Declarations, Arithmetic operators, Relation and logical operators, Type conversions, Increment and decrement operators, …. Logical operators, Assignment operators and expressions, conditional expressions, Precedence and order of evaluation, statement and Blocks, If-else, Elste Switch, While and For loops. Do-while loops, Break and Continue, Goto and labels.

UNIT- III : Functions and Program Structures: Basic of functions. Functions maturing non- integers, External variables, scope rules, Header files, Stain variables register variables, Block structure, Initialization, Recursion. The C preprocessor.

UNIT – IV : Pointers and Arrays: Pointers and addresses, Pointers and function arguments, Pointrs and arrays, Address arithmetic, Character pointers and functions, Pointer arrays: Pointers to pointers, Multi dimensional arrays, Initialization of pointer arrays, Initialization of pointer arrays, Pointer vs. Multi dimensional arrays, Command-line arguments, Pointer to functions.

UNIT – V : Structures & I/O Basics of structures, Structures and functions, Arrays of structures, Pointers to structures, Self-referential structures, Table lookup, typedef. Unions and bit-fields.

Input and output standard input and output, Formatted output- Print, Variable length argument lists, Formatted input- scan, File access, File descriptor, Low level I/O-Read and Write, Open, Create, Close, Unlink, Random Access – Lseek.

BOOKS RECOMMENDED :

1. R.G. Dromey : How to solve it by Computer, PHI, New Delhi
2. B.W. Kernighan & D.M. Ritchie: The C Programming Language.

REFERENCES : 1. Balagurusamy. The c Programming Language, TMH, 2.Gotfried: The C Programming Language, Schaum Series.

1.6 & 1.7 PRACTICAL MS-DOS, Windows & C Programming

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SEMESTER – II

2.1 MATHEMATICS-II

UNIT – I : Convergence of Sequences' and Series. Concept of Convergence, Limit theorems. Limit theorems weierstrass completeness principle. Subsequences & Bolzano weierstrass theorem. Country's general principle of convergence, limit superior and limit inferior, complex sequences, convergence of sense,sense of positive terms, absolute convergence conditionality convergent sense power series.

UNIT – II : Sense solution of difference equations. & Special functions. Power sense method Legendre's equation and lengendre. Polynomial, Frobenious Method. Basselt Equation and Basses' Function of first and second kind, storm liourvilive problem Orthogonality and Eigen function expansion.

UNIT – III : Laplace Transforms, Inverse Transform, transform of derivatives Sense

UNIT – IV : Vector Differential Calculture Vector and scalar functions and fields, Denvavatives, Curves, Tangents, Arolength, Velocity and acceleration, gradient of a scalar filed, Directional derivative, Divergence and curt of a vector field.

UNIT – V : Vector Integral calculus : Line integrals, Double Integrails, Green's theorem in the plane, surfaces and surface integrals, Triple integrals, Divergence theorem of Gauss, Applications of divergence theorem and Stake's theorem.

BOOKS PRESCRIBED:

1. G. Das & S. Pattanayak: Fundamentals Mathematical Analysis, Tata Mc. Craw Hill, Ch. 4 (excluding 4.5 and 4.15)
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons. 7th Edition. Chapters 5, 6 & 8 (excluding 8.1 – 8.3, 8.7, 8.12) and 9, 3. J. Sinharoy & S. Padhy, A Course on Ordinary and Partial Differential Equations, Kalyani Publishers, Chapters – 9. 10

REFERENCES: 1. M.C. Potter & J. Goldberg : Mathematical Methods, Prentice Hall of India

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2.2 DISCRETE MATHEMATICAL STRUCTURES

UNIT – I : Fundamentals Logic: Logical Inferences, Methods' of proof of an implication First order logic and other methods of proof. Rules of inference for quantities propositions, Mathematical Induction.

UNIT – I I : Sets and Fuzzy sets, Relations and Functions, Fuzzy relations, Special properties of Binary Relations. Equivalence Relations. Ordering Relations and Operation on Relations.

UNIT – III : Generating functions of Sequences, Recurrence relations, solving recurrence relations by substitution and generating functions. The method of characteristic roots, Solution of inhomogeneous recurrence relations.

UNIT – I V : Semigroups, Groups and Coding: Semigroups, Groups, Products and Cuoties of groups, Coding of Binary information and Error Deflection, Decoding and Er…. Correction.

UNIT – V : Lattices, Boolean algebras, axoms of a Boolean algebra, Finite Boolean algebra, Boolean expressions, rings, fields, polynomial rings, field extensions.

BOOKS RECOMMENDED:

1. J.L. Mott, A Kandel, T. P. Baker: Discrete Mathematics for Computer Scientist and Mathematicians – Prentice Hall of India, 2nd Edition, 1999, Chapters 1,3,4, (41. – 4.5), 8 (8.1)
2. B. Kolman, R.C. Busby, S. Ross : Discrete mathematical Structures – Prentice Hall of India – Third Edition, 1999, Chapter 5 (5.1, 5.2), 9 (excluding 9.3), 11.
3. Alan Doerr, K.Levasseur, Applied Structures for computer science, Galgotia Publications, 1995 Chapters 13 (13.2 – 13. 6) 16 (16.1 – 16.4)

REFERENCES :

1. Trembley & Manohar Discrete Mathematical Structure with Applications to Computer Science – Tata Mc. Graw Hill, 1997
2. K.E. Rosen. Discrete Mathematics and its applications – Mc. Graw Hill International 4th Edition. 1999.

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2.3 PRINCIPLES OF MANAGEMENT & ORGANISATIONA BEHAVIOUR

UNIT – I : Concept of Management Features of Management, Importance of Management: Nature of Management, Management as profession, Social Responsibility of Management, Management functions.

UNIT – II : Concept of Planning: Types of plan, steps in planning, Decision-making; Management by Objectives (MBO), Forecasting.

Concept of organization, Organization Structure, Formal & Informal organization Matns Organization, Centralization & Dependalization, Authority & Responsibility Delegation.

UNIT – III : Fundamentals of staffing : HRIS, Demand analysis, Recruitment & Selection, Appraisal, Training & Development Promotion.

UNIT – IV : Directing Space of Central, Management theory, Supervision, Organization behavior, Group behavior, Group Dynamic leadership,

UNIT – V : Controlling concept, Planning & controlling, Types, information control, Management information system, management control, Case study.

TEXT BOOK:

1. Principle & Practice Management by L.M. Prasad
2. Essential of Management by Harold Koontz & Heinz Welhritz Tata Mc. Graw HiII.

REFERENCE BOOK:

1. Management by Stephen P. Robbins & Mary Coutter PHI Publication
2. Management by Jemes A. F. Stoner, Pearson Practice Hall.
3. Management by Griffin AITBS.

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2.4 COMPUTER ORGANISATION & ARCHITECTURE

UNIT – I ADDRESSING METHODS AND MECHINE PROGRAM SEQUENCING

Memory Locations, Addresses and Encoding of Information, Main Memory operations, Instructions and Instruction sequencing, Addressing Modes, Assembly Language, Basis Input cutput Operations. Stacks and Cueues, Subroutines.

UNIT – II PROCESSING UNIT

Fundamental concepts, Execution of a complete instruction, Hardwired Control Performance Considerations, Micro programmed Control.

UNIT – III INPUT – OUTPUT ORGANIZATION

Accessing I/O cevices, Interrupts, Direct Memory Access, I/O Hardware, Standard I/O interfaces.

UNIT – IV MEMORY

Basic concepts, Semiconductor RAM memories, Read only memories, spead size and cost, Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements.

UNIT – V ARITHMETIC

Number representations, Addition of Positive Numbers, Design of Fast Addend Signed addition and subtraction, Arithmetic and subtraction, Arithmetic and Branching Conditions, Multiplicate of positive numbers, Signed. Oper and Multiplication, Fast Multiplication, Integrated Division, Floating, Point Numbers and Operations.

TEXT BOOKS:

1. **V. C. Hamacher, Z.G. Vranesic, s.G. Zaky 'Computer Orgaization, Mc. Graw H. International.**

REFERENCE BOOKS:

1. M. Aano, Computer System Architecture, PHI
2. J. P. Hayes, Computer Architecture and Organization, Mc. Graw Hill - International

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2.5 DATA STRUCTURE

UNIT – I : Data, Data type, Abstract data type, Data Structure and its classification, Arrays, Stacks and Queues: Operations, Implementation and Applications.

UNIT – II : Dynamic Data Structure: Linked List, linked stacks and queues, Application to Polynomial arithmetic.

UNIT – III : Graphs and trees: Classification and Representation, Binary tree traversal algorithms, Applications.

UNIT – IV : Search techniques, Search trees: BST, AVL tree, B-tree: Implementation and applications, Hashing.

UNIT – V : Sorting and merging techniques, Introduction to storage allocation, garbage collection and compaction, Time and space complexity of algorithms. Order notations.

BOOK RECOMMENDED:

1. R.L. Kruse, B.P. Leung, C.L. Tondo : Data Structure and Program design in C (PHI)
2. Y. Langsam, M.J. Augestein, A.M. Tanenbaum: Data Structure using C and C^{++} (PHI)

REFERENCES:

1. A.V. Ano, J.E. Ho….. & J.D. Uliman: Data Structure and Algonthms (AM)
2. E. Horowtz and S. Sahani: Data Structure in Pascal (Galgota)
3. Trembly and S. Sorenson: Data Structure: Theory and Application (TMH)
4. D.E. Knuth, Fundamentals of Algorithms (Narosa PH).

2.6 MS-Office & 2.7 Data Structure Using C

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3.1 – COMPUTER ORIENTED NUMERICAL METHODS

UNIT-I : Interpolation, Lagrange interpolating polynomial, error, interpolating polynomial using divided differences, forward and backward interpolating, Newton interpolating polynomials, Approximation of functions, least squares approximation.

UNIT-II : Solution of non linear equations, bisection method, secant method, Newton's Raphson method, fixed point iteration method, Aitken's delta square process, Solution of linear system of equations, Gauss emanation method, matrix factorization method (Crout, Dolittle, and Cholesky's method), Gauss Jacobi and Gauss Seidel method.

UNIT-III: Numerical integration: Newton Cote rules, Compound Quadrature method, Remberg integration, Gauss quadrature rules, Gauss Legender rules, Numerical solutions of different equations: Euler's method, Taylor's series method and Runge-Kutta methods.

UNIT-IV : Programming in FORTAN 90: Constants, variables, anthmetic expressions, input-output statements, conditional statements, loops, logical expressions, control structure, functions and subroutines, Array.

UNIT-V : Format specifications, processing of strings and characters, procedures with array arguments, derived types, file processing, pointer data-type, use of modules.

TEXT BOOK:

1. A COURSE ON NUMERICAL ANALYSIS By B.P. Acharya and R.N.Das (Kalyani Pub.), Chapter 2(2.1-2.4,2.6-2.9), Chapter 3 (3.1-3.4,3.6-3.10), Chapter 4(4.3,4.5), Chapter 6(6.1-6.5,6.8,6.10,6.11), Chapter 7(7.3,7.4,7.6,7.7), Chapter 8(8.1,8.2,8.4)
2. V.Rajaraman- Computer programming in FORTRAN 90 and 95. PHI, 1997.

REFERENCE:

1. Numerical methods for mathematics, science and engineering, John H Mathews(PHI)

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3.2- MANAGERIAL ECONOMICS

UNIT-I : Meaning, Nature & Scope of Economics, Nature of human wants, Concepts of wealthy utility, value and price, Microeconomics: its principles, limitation & importance, Difference between micro & macro economics.

UNIT-II : Managerial Economics: Factors influencing managerial decisions, Managerial economics and other disciplines, objectives of the firms, managerial decisions, Demand Analysis : Meaning & types of demand, Determinants of demand, law of demand & exceptions to it, law of diminishing marginal utility, Equi-marginal utility.

UNIT-III : Elasticity of Demand, Determinants of Elasticity, Measurement of elasticity, income elasticity and cross elasticity, Demand forecasting and its method (in brief), Law of supply and exceptions to the law of supply, elasticity of supply.

UNIT-IV : Production & Cost Analysis: Production function, Factors of production, law of variable proportion, Return to scale, managerial uses of production function. Cost Concepts: Types of cost, short run cost curves & long run cost curves, Determinants of costs.

UNIT- V : Definition & classification of markets. Revenue concepts of Pricing: Average, Marginal and Total Revenue, Determinants of Price, Pricing under different objectives, Pricing under different market structures & equilibrium of firm (perfect and monopoly) price discrimination.

BOOKS RECOMMENDED

Joet Dean – Managerial Economics
Dwivedi – Managerial Economics
Varshney & Maheshwari – Managerial Economics
V.L. Mote. Paul & Gupta – Managerial Economics Concepts and Cases.
Gokhale & Others – Business Economics, Ahuja – Micro Economics, Jhingasi – Micro Economics
Samuelson & Mordthans- Economics *****

3.3 OPERATING SYSTEM

UNIT- I : What is an OS? Early systems, batch systems, time shared systems, PC systems parallel systems, distributed systems, real-time systems, System structures Computer system operation I/O structure, storage structure, hardware protector system architecture, system components, OS services, system calls, system programs, system structure, virtual machines, system design and implementation system generation.

UNIT- II : Process: Process concept, process scheduling, operation on processes, cooperating processes, threads, and inter process communication. CPU scheduling basic concepts scheduling criteria, scheduling algorithms, multiple Process or scheduling, real-time scheduling.

UNIT- III : Process synchronization: Back ground, critical section problem, synchronization hardware, semaphores, classical problems of synchronization, critical regions, monitors, and atomic transactions. Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

UNIT- IV : Memory management Background, logical vs physical address space, scrapping contiguous allocation, paging, segmentation, segmentation with paging. Virtual memory. Background, demand paging, page replacement with algorithms allocation of frames, thrashing, and demand segmentation.

UNIT- V : File system: File concepts access methods, directory structure, protection, fill system structure, allocation methods, free-space management, direction implementation, and recovery, Secondary-storage structure: Disk structure disk scheduling, disk management, scrap space management, disk reliability, and staple-storage implementation.

BOOK RECOMMENDED:

1. Operating system concepts by A, Siberschatz and P.B Galvin (Addison-Wesley
2. Operating systems by William Stallings (PHI)
3. Operating systems by Milan Milenkovic (Mc-Grew Hill)
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3.4 FILE STRUCTURES

UNIT- I : DATA PROCESSING ACTIVITIES AND FILE ORGANIZATION

Data Vs information cost and value of information, data processing functions, data recording, I/O and storage devices. Files, file organization, file operations performance considerations, file storage devices: characteristics of file storage devices, magnetic tape vs magnetic disk storage other direct access storage devices.

UNIT- II : SEQUENTIAL FILE ORGANIZATION AND FILE SORTING

Sequentially organized file: creation, retrieval, update and design of sequence files, sorting and merging files: natural merge, balanced merge and polyphony merge cascade merge, sort/merge performance.

UNIT- III : RELATIVE FILE ORGANIZATION

Relative files: direct mapping techniques, absolute Vs. relative addressing, directory look up techniques, address calculating techniques, hashing techniques, Approaches to the problems of collisions linear probing, double hashing, synonym chaining, bucket addressing.

UNIT – IV : INDEXD – SEQUENTIAL FILE ORGANIZATION

Indexed-sequential file-dense Vs, non dense index, Primary Vs. Secondary index, multi level index, clustering index, structure of index sequential files ISAM Vs. VSAM, implementation of indexing binary search tree, m-way search tree, b-tree etc.

UNIT V: MULTIKEY FILE ORGANIZATION AND INTRODUCTION TO DBMS

Multi key files: need for multiple access paths, inverted file vs. multi list file organization, comparison and trade-off, file design summary. Introduction to DBMS databases, database views database models. E. R. model, relational model, database implementation support, DBMS.

TEXT BOOK:

1. DATA MANAGEMENT AND FILE PROCESSING BY May E.S. Loomis, PHI
2. INFORMATION SYSTEMS THROUGH COBOL BY A.S. Philippakis and
3. L.J Kazmier, Mc. Grew Hills.

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3.5 OBJECT ORINTED PROGRAMMING WITH C++

UNIT- I : C++ An Overview: Principles of Object Oriented Programming, object based and object-oriented programming, concepts of C++, C++ tokens, basic data types, user-defined data types, derived data types, expressions, Operators, control Statements.

UNIT- II : Procedure based Programming: Functions, main function, function prototyping, call-by-reference, return by-reference function, lnline function, scope and lifetime, Overloaded function, Function templates, Exception handling.

UNIT- III : Object based Programming: Class, Class initialization, defining member functions, private member functions, object as function argument, friend function, constructor, destructor, overloaded operators, class templates.

UNIT- IV : Object-Oriented Programming: Class inheritance, defining derived classes, types of inheritance (single, multilevel, hierarchical, hybrid), constructors in derived classes, run-time polymorphism and virtual function.

UNIT- V : I/O & File handling: Console I/O operations, opening and closing a file, file modes, working with files.

BOOK RECOMMENDED:

1. C++ PRIMERE BY S.B. Lippman and J.Lajole (AWL)
2. OOP with C++ by Balagurusway (TMH) 3. Prog. With C++ by B. Stroustrup(AWL)

3.6 & 3.7 PRACTICAL Numerical Computing & Programming in C++

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4.1 PROBABILITY AND STATISTICS

UNIT – I : Statistics- Definition and use, Statistical data, Frequency distribution and its characteristics, and its characteristics, sample space, events, and algebra of events, probability axioms, Additive and multiplicative laws of probability and applications. Conditional probability, Independence of events, Bayes Rule.

UNIT- II : Random variables- Discrete and continuous, Discrete random vanables. The probability mass function, special discrete distributions, Binomial and Posson distributions, Discrete random vectors, Independent random variables, continuous random vanables- probability density function and probability distribution function, uniform, Normal and exponential distributions, Functions of a random variable jointly distributed random variables, Distribution of sums, Function of Normal vanables. The reliability, Failure density and Hazard function.

UNIT III : Expectation of a random variable, Moments, Expectation of functions of more than one random variable, moments of important distributions, conditional distribution and conditional expectation. Inequalities and Limit theorems Markov inequality, Chebychev inequality. Weak law of large numbers and central limit theorem (without proof.)

UNIT- IV : Population, sample, Random Sampling, Simple Random Sampling and Stratified sampling, parameter, Statistic and its sampling distribution, Standard error Random sampling from a probability distribution, sampling distribution of mean and vanance in sampling from normal distribution, statistical difference- parameter estimation and hypothesis testing. Point estimation – Estimator, properties, Methods of Estimation – method of moments, method of maximum likelihood, Interval estimation – Confidence intervals, testing of Hypothesis – Type ll error, Power of a test level of significance. Neyman – Pearsan theory (concept only) Most powerful test. Tests of significance based on normal, and Chi-square distributions.

UNIT – V : Correlation and Regression- Meaning and Concept, Linear Correlation measurement, coefficient of correlation, Regression Lines – method of computation, Non-linear regression. Coefficient of determination, Test of regression relationship, Multiple correlation and regression- Computation and analysis. Analysis of variance.

TEST BOOK

1. Probability and Statistic with Reliability, Queuing and Computer Science
2. Applications – Trivedi (PHI)
3. A first course with Statistics and Applications – A.K. P.C. Swain (Kalyani Publisher)
4. Fundamentals of Statistics (Vol-I) Goon Gupta and Dasgupta (World Press).

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4.2 ACCOUNTING AND FINANCIAL MANAGEMENT

UNIT – I : Accounting the language of Business, Accounting as an information system, Generally accepted Accounting Principles, Accounting Equations. Accounting Standards.

UNIT- II : Types of Accounts, Process of recording financial information Journal and Ledger, Manual Accounting System and Computerised Accounting System.

UNIT – III : Sub-Division of Journal, Cash Book, Bank Reconciliation Statement, Capital and Revenue items, Trial Balance and Errors.

UNIT- IV : Preparation of Final Account; Manufacturing Account , Trading Account, Profit and Loss Account and Balance Sheet, Adjustments in Final Account.

UNIT- V : Company Acounts, Share Capital and Loan Capital, Understanding Company Final Accounts, Annual Reports of the Company.

BOOKS RECOMMENDED:

1. Meigs & Meigs: Accounting: The Basic for Bsusiness Decisions (Mc Graw Hill)
2. Bhattacharya & Dcarden: Accounting for Management Test & Cases (Vani)
3. Juneja & Sarena: Chawal Accounting: Theory and Practice (Kalyani)
4. Grewal, T.S. : Introduction to Accountancy (S. Chand)
5. Agrawal: Financial Accounting : Advanced(Pitamber)

4.3. Business Communication Skills

UNIT – I

Nature and modes of communication, Speaking and writing, Audience, Subject, Time and place, Purpose, Different ways of communication narrative, description, exposition, Argument

UNIT- II

Documentation: references, Notes and bibliographies, Technical reports. Placing orders, Making of use of Audio Visual Aids.

UNIT- III

Business letters fax and E-mail

UNIT- IV

Application for a job and constructing a curriculum vitae, facing the interview, participating in the group discussion, Presentation.

UNIT- V

Organizing a Meeting: The chair person's job, preparing an agenda, Introducing a guest, proposing a vote of thanks, writing the minutes, interpersonal effectiveness: Useful expressions in everyday life situations – Introductions, Greeting, Thanks, Apologies, regret, Saying goodbye, suggestions, Invitations, Good wishes, Requests, Asking permission, Speaking on the telephone.

Books Recommended:

1. Chand J. K. Das B.C – A. Millennium Guide to Writing and Speaking English, Friend's Publishers, Cuttack.
2. Harris, S. – Human communication, BPB Publications.
3. Pradhan, Bhenda Thakur, - Business Communication, Himalayas Publishing House
4. Seelay John – Oxford Guide to Writing and Speaking, OUP
5. Krishna Mohan & Mira Banarji – Developing Communication Skills, Macmillan

Reference:

1. The Chicago Manual of style, 13th Ed., Prentice Hall of India

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4.4 DATA BASE MANAGEMENT SYSTEM

UNIT – I : Database system concepts and Architecture: Data Models, Schemes and Instances, DBMS Architercture and Data independence, Database Languages and Interfaces, Database System Environment, Data Modelling using Entity Relationship Model, Entity types, Entity Sets, Attributes and keys, relationships, Relationship types, rules and structural constraints.

UNIT- II : Network Data Modelling concepts constraints in the network model, network DDL and Network DML, Hierarchical Data base structures, Integrity constraints in hierarchical model, Hierarchical DDL and Hierarchical DML.

UNIT- III : Relational Model concepts, Relational constraints and Relational Database Schemes, Update operations and constraints violations, Basic relational Algebraic operations.

UNIT- IV : Functional dependencies and Normalization for RDBSM: Design guidelines for relational schemes, Functional dependencies, Normal forms based on primary keys, second and third normal forms, Boyce Codd normal form, Algorithms for Relational Database scheme Design, Multivalued dependencies and fourth normal form, join dependencies and fifth normal form.

UNIT- V : Transaction processing, transaction and system concepts, Desirable properties of transactions, schedules and recoverability, serialisability of schedules, locking techniques in concurrency control, concurrency control based on time stamped ordering, Recovery Concepts.

BOOKS RECOMMENDED:

1. Elmasari, Rand Havathe, S.B.: Fundamentals of Database system 3rd Edition

REFERENCES

1. Rama Krishna, R and Gehi-Ke, J. Database Management Systems 2nd Edition

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4.5 COMPUTER GRAPHICS

UNIT – I : Survey of computer graphics applications, overview of graphics system – video display devices, raster scan systems, graphics monitors and workstations, input devices, hard copy devices, graphics software, graphical user interface and interactive input methods- the user dialogue, input of graphical data, input functions, interactive picture construction, virtual reality environment. Output primitives-line, circle and ellipse, generating algorithms, pixel addressing, filled area primitive, character generation.

UNIT- II : Attributes of output primitives-line and curve attributes, colour and gray scale levels, and area-fill attributes, colour and gray scale levels, and area-fill attributes, character attribute, bundled attribute and antialasing, Two-dimenaio nal geometric transformation basic transformation translation, rotation, sealing and matrix representation. Composite transformation translation, rotation, scaling, reflection, shear, Transformation between coordinate system, offline transformation.

Two-dimensional viewing-viewing coordinates, point, line, polygon, Curve and text dipping.

UNIT- III : Structure and hierarchical modeling, three dimensional display methods, three dimensional object representation polygon surface, quadratic surface, straight line representation, Bezier curves and surfaces, b-straight line, curves and surfaces, displaying straight line curves, sweep representation, constructive solid geometry methods, BSP trees, fractal geometry method.

UNIT – IV : Three dimensional geometric and modeling transformation translation, rotation, scaling, reflection, shears, coordinate transformation. Three dimensional viewing-viewing coordinates, projection, projection transformation and clipping.

UNIT – V : Visible surface detection methods depth buffer ….depth sorting BSP tree method, Ray casting method. Illumination method, displaying light intensities method, Dithering techniques, polygon rendering methods, Gourard shading, Phong shading, Computer Animation, Design of an motion sequences, General Computer-Animation Functions, Raster Animations, Computer Animation Languages, Key Frame Systems, Motion Specification.

TEXT BOOKS

REFERANCES

1. J.D. Folay, A. Vandan, Feinersteven High John – COMPUTER GRAPHICS
2. PRINCIPLES & PRACTICE (ADDISNWESLEYPUB-1999)

4.6 & 4.7 PRACTICAL Database Lab. (Cracle) & Graphics Programming

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5.1 COMBINATORIES & GRAPHTHEORY.

UNIT-I : Graph, finite &indianite Graphs, Incidence and Degree, isolated vertex, pendant vertex, Null graph, konisberg Bridge, isomorphism, sub graphs, walk, paths, circuits, connected graphs, disconnected graphs, components, Euler graphs, operations on graphs, Hamiltonian path and circuits, Traveling salesman problem.

UNIT-II : Tree and Fundamental Circuits, cuts seps and cut-vertices.

UNIT-III : Planar and Dual graph, Vector spaces of a Graph.

UNIT-IV : Matrix Representation of graph coloring, covering, and partitioning, Directed Graphs, Enumeration of graphs, Graph Theoretic algorithms and computing programs.

UNIT-V : Elementary combinatorics: Basic of counting, Combinatory and permutations, Enumeration of combinations and permutations, enumerating permutes with constrained repetitions, Binomial coefficients and Malfunctional theorems, principles of inclusion-Exclusion.

BOOKS RECOMMENED:

1. N. Deo-Graph Theory-prentice Hall of India.
2. J.L.Mott,A.kandel,T.P.Baker-Discrete Mathematics for computer scientist and Mathematicians-prentice Hall of india.

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5.2 COMPUTE COMMUNICATIONS & NETWORKING.

UNIT-1 : Introduction: uses example of network, Network hardware, Network software Reference model of networks. Transmission terminology. Simplex data transmission, Transmission impairments Transmission media & its characters.
UNIT-II : Data encoding and communication techniques, Modulation A.M, F.M, P.M, PCM. Asynchronous and synchronous transmission, communication interface RS-232c x 21.multiplexing :FDM, TDM, Modems, Multiplexer/ demultiplexer , concentrators, Front-end processor.
UNIT-III : Data link layer, Functionally, framing error detection and correction-FEC, REC, CRE, Hamming and other codes, MAC sub-layer/Advantage of multiple access sharing of channels. ALOHA ,CSMA/CD, Polling based MAC protocols, Token bus and Token ring.
UNIT-IV : Network layer. layer functionality, connection-oriented and connectionless server, routing-static & dynamic routing algorithms, ip-protocols, ip-routing, congestion control, Transport layer, TCPAP, elements of transport protocols: addressing, establishing and releasing a connection, the internet Transport protocol-TCP and UDP.
UNIT-V : Application layer Network security, DNS, SNMP,E-mail and Introduction to ATM.

BOOKS RECOMMENDED:

1. Tannenbaum,A.S "computer networks",PHI
2. Forouzan B.A "Data communication and Networking, Tata Mc Graw Hill.
3. Black U computer networks-protocols, standards and interfaces.PHI
4. Stallngs W "computer communication Networks"(4^{th} edition)PHI

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5.3 SOFTWARE ENGINEERING

UNIT-I : Introduction: The software problem, software engineering problem, The software engineering Approach.
Software process: software process, characteristics of software process, software development process, project management process, software configuration management process.
Software requirements: Need for SRS, Requirement process.
UNIT-II : Planning a software project cost estimater project scheduling, staffing and personal planning, software configuration management plans
UNIT-III : Function oriented design: Design principles, module level concepts, design Notation and specification, structured design methodology.
UNIT-IV : Detailed Design: Module specifications, PDL, Logic/Algorithm Design, Verification, cyclometer complexity, data binding and cohesion metrics, coding: programming practice, verification, size ,complexity and style metrics.
UNIT-V : Testing: Testing fundamentals, functional Testing, structural testing, Testing process, reliability estimation.

TEXT BOOKS:

1. Jalote p."An integrated Approach to software engineering"(Narosa).

REFERENCE:

1. Pressman R.S,"software engineering:A partitioner,s Approach fifth edition (Mc graw Hill).
2. Someville I "software engineering ".6 th edition(pearson education)
3. Fairtey R.E."software engineering concepts".(Tata mc graw hill)
4. Mall R,"Fundamentals of software engineering" (prentice Hall of india)

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5.4 UNIX & SHEEL PROGRAMMING

UNIT-I : General overview of the system : History of Unix, Reasons for success system architecture (layered structure),file system(characteristics & structure).processing environments, Building block primitives, OS services, Modes of operations, interrupts & exceptions, processors execution levels, memory management.
UNIT-II : Introduction to the kernel: Architecture set of system calls (for file subsystem and process control subsystem).overview of file subsystem: Internal representation data structures, files system structure. Processes: Regions of processes data structure, context of process, process states ,state transitions.
UNIT-III : Vieditor and its commands. Shell commands: general-purpose utilities, navigating the file system, handling file basic file attributes, filters, processes, communications.
UNIT-IV: Shell programming: shell metacharacters, shell variables, shell scripts, shell commands, environment, shell scripts: the case statement while and until loop the if statement, the test command, error checking.
UNIT-V Unix system tools :grep, egrep, sed, tr, awk.

TEXT BOOKS:

1. Maurice j bach,"The design of the unix operating system".prentice hall of India.
2. Stephen prata, Advanced UNIX-A programmers guide, SAMS,BPB publications.

REFRENCE:

1. Behurouz A forozan, unix and shell programming with infotrac : A textbook.
2. Stephen kochan,UNIX shell programming, Revised edition.

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5.5 VISUAL AND WINDOWS PROGRAMMING

UNIT-I : Mastern: the Integrated Development Environment (IDE): IDE Features: Menu Bar, Tool Bar, Project Explorer, Properties Window, Form layout, Window, Toolbox, Form Designer, Object Browser, Creation of Applet Working with Forms: The border, Title Bar, Caption, Control Menu, Minimize button, The Maximize/Restore Batton, Working with form properties, (Back color, Borcer Style, caption, control box, fore color, height, icon, left max button, min button, name, window state). Form Events: The active event, Deactive event, Load event, Resize event, Unload event Working with Multiple Document Interface (MDI) forms: Creating MDI, Creating child form, Manipulation on MDI form, Control objects command button, Test boxes, Labels, Option button, Check box.

UNIT- II : Events and Methods, Frame Control, List Boxes, Combo Boxes, Image object, Picture Object, Timer, Scroll Bar, Drive List, Directory list boxes, File list box, Status bar, Manipulating Controls at run time, Early and late binding variable.

UNIT- III : Above X Control, ADO (Active Data Object, ABODE, …….

UNIT IV : Implementing the Document, Strong the graphic data, Redraw the window, Adding the Menu Command, Deleting the Menu Commands, Storing Documents in Disk files, Scrolling and splitting the views.

UNIT- V : Including Docking Toolbars and Status Bars, Creating Custom dialog boxes, Writing dialog based Applications; Performing Character I/O.

Books Recommended:

1. Visual Basic 6 (Complete Reference) Denise Santoro, Gary Masters, BPB Publication.
2. Beginning Visual Basic 6 : By Peter Wright, SPD Pvt. Ltd. Wrox Press.
3. Mastering Visual C++: By Michael J. Young, BPB Publication.

5.6 & 5.7 : PRACTICAL Unix Shell Programming & Visual Programming

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6.1 OBJECT ORIENTED DESIGN USING UML

UNIT – I Introduction: What is Object Orientation? What is Object Oriented Development? Object Oriented Themes, Evidence for usefulness of Object oriented Development Modeling as a Design Technique Modeling. The Object Modeling Technique Object Modeling; Objects and Classes. Links and Associations, Advanced Link and Association Concepts, Generalization and

inheritance, Grouping Constructs. Advanced Object Modeling; Aggregation, Abstract Classes, Generalization as Extension and restriction. Multiple inheritance, Metadata, Candidate Keys Constrains.

UNIT- II Dynamic Modeling: Events and States, Operations, Nested State Diagrams, Concurrency, Advanced dynamic Modeling Concepts, Relation of Objects and Dynamic Models, Functional Modeling, Functional Models, Data Flow Diagrams, Specifying Operations, Constrains, Methodology Preview, and OT as a Software Engineering Methodology. The OMT Methodology, impact of an Object Oriented Approach.

UNIT- III Analysis: Overview of Analysis, Problem Statement, Object Modeling, Dynamic Modeling, Adding Operation, System design; Overview of System Design, Breaking a System into Subsystems, identifying Concurrency, Allocating Subsystem to Processors and Task, Management of Data Stores, Handling Global Resources, Choosing Software Control implementation, Handling Boundary Conditions, setting Trade-Off Priorities, Common Architectural Frameworks, Object Design: Overview of Object Design, Combining the Three Models, Design Algorithms, Design Optimization, implementation of Control, Adjustment of inheritance, design of Associations, Object Representation, Physical Packaging.

UNIT- IV Methodology Summary: Analysis, System Design, Object design Comparison of Methodologies Structured Analysis/Structure Design, Jackson Structured Development, Information Modeling Notations Object Oriented Work. From Design to implementation; implementation Using a Programming language, implementation using a Database System, implementation Outside a Computer.

UNIT- V Programming Style: Object Oriented Style, Reusability, Extensibility, Robustness, Programming in the large Object Oriented language. Translating a Design into an implementation, Class Definitions, Creating Objects, Calling Operations, Using inheritance, implementing Associations, Object Oriented Language Features. Relational Databases: General DBMS Concepts. Relational Database Design, Advanced Relational DBMS.

BOOK RECOMMENDED

1. G. Booch, J. Rumbaurge, I. Jacobson- The Unified Modelling Language user guide- Addition Wesley Longmans, (relevant portions)
2. G. Booch – Object Oriented analysis & design with applications – 2nd Edition, Addison Weseley, 1994 (Chapter 2,3)
3. C. Larman – Applying UML and patterns – An introduction to Object Oriented Analysis & Design, Prentice Hall PTR, 1998

REFERENCES

1. J. Rumbaugh, M. Blaha, W. Premeriari, F. Eddy, W Lorensen- Object Oriented Modelling and design, Prentice Hall of India 1991
2. I. Jacobson, G. Booch, J. Rumbaugh – The Unified Software Development Process – Addison Wesley Longmans, 1999.
3. J. rumbaugh, I. Jacobson, g. Booch – The Unified Modeling Language Reference Manual Addison Wesly Longmans, 1999
4. R. W. Brock, B. Wilkerson, L. wiener – Designing Object Oriented Software – Prentice Hall of India 1990.
5. S.S. Alhir – UML in a nustshell- O'relly 1998.

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6.2 E- COMMERCE

UNIT – I : Introduction what is e-commerce? Forces behind e-commerce, e-commerce industry framework, bnef history of e-commerce. Interorganizational e-commerce, intraorganizational e-commerce, consumer to business e-commerce, architectural framework.

Network infrastructure for e-commerce: Network infrastructure for e-commerce, market forces behind i-way, components of i-way, access equipment, global information distribution, broadband telecommunication.

UNIT- II: Mobile commerce: Introduction to mobile commerce, mobile computing applications, WAP, WAP technology, mobile information devices.

Web security, Introduction to web security, firewalls, transaction security, client server network, emerging client-server security threats, firewall & network security.

UNIT III : Encryption: WWW & security, encryption, transaction security, secret and public key encryption, virtual private network, implementation of management issues.

UNIT- IV : Electronic Payment System (EPS): Overview of EPS, smart card, credit card & debit card based EPS, financial instrument, Home banking, Online banking.

UNIT – V : Net Commerce: EDI, EDI application in business, legal requirement in e-commerce. Introduction to supply chain management, CRM (Consumer Relationship management) Issues in CRM.

TEXT BOOK

1. T.N. Chhabra, R.K. Suri, Sanjiv Verma- e-commerce: New vistas for business- Dhanpat Rai & Co. Publication

REFERENCES

1. Kalakota & Whebiston – Frontiers of e-commerce, Pearson
2. Ritendra Goel – e-commerce – New Age international
3. Elias M. Award – e- commerce, Pearson

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6.3 MANAGEMENT INFORMATION SYSTEM

UNIT – I : Management Support System: An overview, Managerial decision-making and Information Systems, Managers and Computerized Support, Need for Computerized decision support and the supporting technologies, A framework for Decision support, The concept of DSS, GSS, Expert-systems, knowledge management systems. Decision Making: Introductions and Definitions, systems, Models, Decision Making (The intelligence phase, the design phase and the choice phase), Evolution, the implementation phase.

UNIT- II : DSS: An Overview, what is a DSS? Characteristics and capabilities of DSS, Components of DSS, Data Management Subsystem, Model Management subsystem, Knowledge-based Management subsystem, Dialog subsystem, DSS Vs MIS, Data Warehousing, Analysis, Mining and Visualization: Data Warehousing. Access, Analysis and Visualization, The nature and Source of Data, Data Collection, Problems and Quality, DBMS in DSS, GIS.

UNIT III : Modeling and Analysis : Modelling for MSS, Static and Dynamic models, Treating Certainly, Uncertainly and risk, MSS modeling in spreadsheets, Decision Analysis of a few alternatives DSS Development introduction to DSS Development SDLC, Alternate development Methodologies, Prototyping, DSS technology levels and tools, DSS Development platforms.

UNIT- IV : Group Support Systems: Group Decision Making, Communication and Collaboration, Communication Support, Collaboration Support Group Support Systems and its technologies, The GSS Meeting process knowledge Management Knowledge, Organizational learning and Organizational memory, Knowledge Management. The Chief Knowledge Officer, Knowledge Management Development, Knowledge Management Methods, technologies and tools, Knowledge Management Success.

UNIT- V : Implementation and Integrating MSS: Implementation, I Major Issues, Implementation Strategic, Generic models of MSS Integration, Models of ES and DSS Intergration, Intelligent DSS, Intelligent Modeling and Model Management impacts of MSS; Overviews of impacts, Organizational Structure and related areas, MSS support to BPR, Personal Management issues, impact on individuals, impacts on productivity, Quality and Competitiveness.

TEXT BOOKS:

1. Decision Support Systems and Intelligent systems, by Efraim Turban and Jay E. Aronson.

REFERENCE :

1. Decision Support and Data Warehouse Systems, by Efrem G. Maltach.
2. Decision Support System, by George M. Marakas

3. Decision Support System, by V.S. Janakiram and K. Sarukesi

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6.4 INTERNET & JAVA PROGRAMMING

UNIT – I : Running a Java Program, Data types, Variables, Operators, Control Statements, Arrays, introduction to classes, Classes/Methods: Constructors and Destructors, Garbage Collection, Overloding Methods, Passing objects as parameters, inheritance; concept and use of super class, multilevel Hierarchy, Method of Overriding, Using abstract classes, packages, Interfaces.

UNIT- II : Exception Handling, Multithreading Programming, Creating a Thread: Implementing the run able interface, Extending the thread class, Creating multiple threads, thread prionties, Synchronization of threads, Interthread Communcation, Stream classes, Character streams, Apple Class, Event Handling, AWT, Working with Windows, Graphics and text.

UNIT- III : Common HTML commands using head, body, break, paragraph break, text styles, Different type of lists, Adding graphics to HTML documents and Tables, Using width, height, align, border, cell padding, cell spacing, BG color, column span, row span attributes of a table, linking documents and introduction to frames Links, Images as hyperlinks, Framest, frame, name, targeting named frames.

UNIT - V : Building up Java Script Syntax Data types literals, type casting, creating variables, Incorporating variables as a script, java script array, Operators and expressions arithmetic operator, Comparison operator, string operators, conditional operator temary operator, special operators, java script programming constructs, conditional checking, function and dialog boxes, java script document object model, java script assisted style sheets DOM (JSS DOS), browser objects, Handling events in java script, Dynamic HTML: Cascading style sheets : font, color and back ground, text, border, margin, list attributes, using span tag and <DIV>tag, external style sheets.

UNIT – V : Client-Sever concept in internet and communicating on the internet, internet Domains, Establishing connectivity on the internet, URL, Domain name registration. Introduction to WWW. Web server and Browser, Introduction to CGI.

BOOKS RECOMMENDED:

1. Programming with Java: A Primer E. Balaguruswamy, Tata Mc Grew Hills Publishing Co. Ltd. 2nd Edition.
2. Web enabled Commercial Application Development using HTML, DHTML, Java Script, Peri, CGI: Evan Bayrons: BPB Publications.
3. Java in a nutshell: Orally Publiscation.

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6.5 MULTIMDIA & APPLICATIONS

UNIT – I : Introduction, Multimedia Literature, Media & Data Streams(The Perception Medium, The Representation Medium, Presentation Medium, Storage Medium, Informal Exchange, Values and Representation spaces, Representation Dimension), Main

properties of Multimedia System, Multimedia, Traditional Data Streams Characteristics, Data Stream Characteristics for continuous media, Sound/Audio, Basic Sound Concept, Music, Speech, Image Graphics, Computer Image Processing

UNIT- II : Video & Animation (Television, Computer based Animation), Data Compression (Storage Space, Coding Requirements, Source, Entropy & Hyond Coding, JPEG, H.261, MPEG, DVI.

UNIT- III : Optical Storage Media, Computer Technology (Communication Architecture, Multimedia Workstation), Multimedia Operating System, networking System.

UNIT – IV: Multimedia Communication System (Application Subsystem Transport Subsystem, Quality of Servce and Resource Management), Database Systems (Data Analysis Data Structure0

UNIT- V : Documents, Hypertext and MHEG (Documents, Hypertext, and Hypermedia, Document Architecture SGML, Document Architecture ODA, MHEG), User and Interface, Synchronization (Notion of Synchronization, Presentation Requirements). Multimedia Applications (Media Preparation, Media Composition, Media Integration, Media Communication).

TEXT BOOKS

1. Steinmetz R and Nahrstedt K. Multimedia: Computing, Communications & Applications (Pearson Education)
2. Unit – I (Chapters 1,23,4), Unit- II (Chapters 5, 6), Unit- III (Chapters 7, 8, 9, 10), Unit – IV (Chapters 11, 12), Unit (Chapters 13, 14, 15, 17)

REFERENCES:

1. Vaughan Tay, Multimedia, Making it work (Fifth Edition), Tata Mc. Graw Hill
2. Haisat, Multimedia Communications, (Pearson Education)

6.6 & 6. 7 PRACTICAL Java Programming & Mini Project