

## **(B.C.A) Bachelor of Computer Application**

### **SEMESTER -1**

#### **BCA 1001: MATHEMETICS – I**

***Differential Calculus:*** Successive Differentiation, Leibnitz Theorem, Taylors theorem with Lagrange forms of remainders, Expansion of a function of one variable in Taylors and Meclarin's infinite series. Maxima and Minima of one variable, partial derivatives, Euler's theorem, change of variables, total differentiation, Errors and approximation, Taylor's series in two variables, Maxima and Minima of two or more variables.

***Integral Calculus:*** Definite integral and its application for area, length and volume, Multiple integrals, Change of order of integration, Transformation of integral from Cartesian to polar applications in areas, volume and surfaces.

***Differential Equation:*** First degree and first order Differential equation; Higher order differential equation with constant coefficients, Linear partial differential equation of first order P.D.E. of higher with constant coefficients.

#### ***Books:***

1. Das BC and Mukherjee, Differential Calculus, Calcutta, U.N. Dhar Publishers.
2. Das BC and Mukherjee, Intergral Calculus, Calcutta, U.N. Dhar Publishers.
3. Grewal B.S. Higher Engineering Mathematics, Delhi Khanna Publishers.

## **BCA 1002: INTRODUCTION TO COMPUTER SCIENCE**

### ***Introduction to Computer Science:***

Introduction, Characteristics of computers, Evaluation of computers, generation of computers, classification of computer, the computer system, application of computers.

### ***Number Systems and Logic Gates:***

Introduction, Number systems, Convention between number bases, Arithmetic system, signed and unsigned numbers, concept of overflow, binary coding, Logic gate, Boolean algebra, combination of logic gates.

### ***Computer Architecture:***

Introduction, Central Processing Unit (CPU), Memory communication between various units of a computer system, The instruction format, Instruction set, Processor speed, Multiprocessor systems.

### ***Primary Memory***

Introduction, Memory Hierarchy Random Access Memory (RAM), Type of RAM, Read Only Memory (ROM), Types of ROM

### ***Secondary Storage***

Introduction, Classification of secondary storage devices, Magnetic Tape, Magnetic Disk, Magneto Optical Disk.

### ***Input Devices:***

Introduction, Keyboard, Pointing devices, speech recognition, Digital Camera, Scanners, Optical scanner.

### ***Output Devices:***

Introduction, Classification of output, Hard Copy output devices, Printers, Plotters, Computer Output Microfilm (COM), soft copy output devices, Monitor, Audio output Projector, Terminals

### ***Computer Program:***

Introduction, Developing a program, Algorithm, Flowchart, Pseudo code (P-Code)

### ***Computer Languages:***

Introduction, Evolution of Programming Languages, Classification of Programming Languages, generation of programming languages

### ***Computer Software:***

Introduction, Software: Definition, Relationship between software and hardware, software categories, system software, Application software, software terminology.

***Operating System:***

Introduction, Operating system, Evolution of operating system, Type of operating system, function of an operating system, Modern operating systems.

***Data Communication And Computer Networks:***

Introduction, Data Communication, Transmission Media, Multiplexing, Switching, Computer Network, Network Topologies, Communication Protocols, Network Devices

***Internet Basics:***

Introduction, Evolution of Internet, Basic Internet Terms, getting connected to Internet, Internet Application, Electronic Mail: An Introduction How E-Mail works, Searching the web (Search Engines), Languages of Internet, Internet and Viruses.

***Text Book:***

1. Introduction to computer science, ITL Education solution Limited, R&D Wing, PEARSON Education Edition 2004.

***Reference Book:***

1. Rajaraman V- Fundamentals of Computers, Prentice Hall of India Pvt. Ltd, New Delhi – 2<sup>nd</sup> Edition 1996.

## **BCA 1003 : PROGRAMMING IN C**

History and Importance of C, Sample programming, Basic Structure and execution of C programmes, Constants, Variables, and Data Types and various type of declarations, Different type operators and Expressions, Evaluation of Expressions, Operator Precedence and Associability, Mathematical Functions.

Managing Input and Output operations, Decision Making and Branching Decision Making and Looping.

One – dimensional Arrays and their declaration and Initialisations, Two-dimensional Arrays and their initialisations, Multidimensional Arrays, Dynamic Arrays, String Variables, Reading and Writing Strings, Arithmetic Operations on characters, Putting Strings together, Comparison of Two Strings, String – handling functions, Table and other features of Strings.

Need and Elements for user defined Functions, Definition of Functions, Return values and their types, Function calls and Declaration, Arguments and corresponding return values, Functions that return multiple values, Nesting of functions, Recursion, Passing arrays and strings to functions, The Scope, Visibility and Life time of variables.

Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialisation of Structure, Comparing Structure Variables, Operation on Individual Members, Arrays of Structures, Structures within structures, Structures and Functions, Unions, Size of Structures, Bit Fields.

Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialisation of Pointer Variables, Accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and Arrays, Pointers and Character Strings, Arrays of Pointers, Pointers and Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers and Structures, File Management in C.

### ***Text Book:***

1. E. Balagurusamy – Programming in ANSI C, 3<sup>rd</sup> Edn. , TMH, New Delhi ; 2004

### ***Reference:***

1. Programming with C, B.S.Gottfried (TMH)
2. Y. Kanetkar – Let us C, 4<sup>th</sup> Edition, BPB Publication , New Delhi ; 2002

## **BCA 1004: ENVIRONMENTAL SCIENCE**

***Environmental awareness:*** Multidisciplinary nature of environmental science, Definition, scope, importance and need for public awareness.

***Ecology and Environment :*** Concept of an ecosystem, structure and function of an ecosystem, producer, consumer and decomposer, energy and nutrient flow biogeochemical cycles, food chain, food web, ecological pyramid.

***Environmental Pollution :*** Segments of environment, sources, pathways and fate of environmental pollutants, causes of environmental pollution, physical, chemical, and biological transformation of pollutants, population explosion, environment and human health, human rights, value education, women and child welfare.

***Air Pollution :*** Various segments of atmosphere and their significance, classification of air pollutions, toxic effects, sampling and analysis, stationary and mobile emission, sources and their control, photochemical smog, sulphurous smog, green house effect, global warming, ozone depletion, Air (prevention and control of pollution) Act.

***Water Pollution:*** Water resources sources of water pollution, various pollutants, their toxic effect, potability of water, municipal water supply, disinfection, characteristics of waste water, primary and secondary waste water treatment, BOD and COD measurement and their significance, rain water harvesting, water shed management, Water (pollution and control) Act.

***Natural Resources and Biodiversity:*** Renewable and non renewable resources, Forest resource, consequences of deforestation, floods and draughts, equitable use of resources for sustainable development, Dams benefits and problems, Biodiversity: ecosystem diversity, threats to biodiversity, conservation of biodiversity.

A Brief introduction to Noise Pollution, Soil Pollution, Solid Waste Management.

### ***Recommended Books :***

1. De A. K., Environmental Chemistry, Wiley Eastern Ltd.
2. Miller T.G.Jr., Environmental Science, Wadsworth Publishing Co. (TB)
3. Sharma B.K., 2001, Environmental Chemistry, Goel Publishing House, Meerut
4. Odum, E.P., 1971, Fundamentals of Ecology, W.B.Sanders Co. U.S.A.

## **BCA 1005: COMMUNICATION SKILLS/ TECHNICAL ENGLISH**

### ***Introduction:***

Definition, Objectives, Stages of Communication, Essentials of Good/ Effective Communication, Benefits of Good Communication, Gaps in Communication, Communication and Information Technology.

### ***Business Correspondence:***

Structure of a Letter, Inquiry Letter, Sales Letter, Order Letter, Complaints, Complaint Handling, Telemarketing.

### ***Government Correspondence:***

Noting, Routine Letter, Demi-Official Letter Memorandum, Circular, Telegrams, Newsletter.

### ***Writing Skills :***

Report Writing, Scientific Paper Writing, Writing Small Paragraphs & Essays, Composition.

### ***Grammar :***

Sentence Structure, Idiomatic Usage of Language, Tenses, Direct & Indirect Parts of Speech, Active & Passive Voice, Vocabulary.

### ***Selected Short Stories :***

2-3 classic short stories, 2-3 great short stories by Indian writers.

### ***Preparation for Job :***

Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions.

### ***Text Books:***

1. Organisations - Structures, Processes and Outcomes; Richard h Hall; Prentice Hall of India .
2. English for the Secretary; Yvonne Hoban; Tata McGraw Hill.
3. Technical Communication : M. Raman & S. Sharma; Oxford University Press.
4. Business Communication Process and Product : M.E. Guffey; Thomson Learning.

### ***Reference Book :***

1. Human Behaviour at Work; John W Newstorm & Keith Davis; Tata McGraw Hill.
2. The Most Common Mistakes in English Usage; Thomas Elliot Berry, Tata McGraw Hill
3. Business Communication: R.K. Madhukar; Vikas Publication.

## **Additional Optional Course**

### **BCA 1008 DISCRETE MATHEMATICAL STRUCTURES**

Sets, Logic, Direct Proof and Proof by Contra positive, Proof by Contradiction, Prove or Disprove, Equivalence Relations, Functions, Mathematical Induction, Cardinalities of Sets.

Understanding of the basic ideas of sets and functions, including boolean combination of sets, and be able to manipulate such expressions, understanding of the standard propositional logic connectives and be able to convert logical expressions into conjunctive and disjunctive normal form, understanding of the universal and existential quantifiers, familiar with the general concept of binary relation, equivalence and order relations and methods of combining relations, standard graphical representations of relations, principle of mathematical induction, inclusion-exclusion principle in simple counting examples, basic ideas of probability.

Calculate probabilities in simple experiments.

#### ***Text Books:***

1. TRUSS, J.K. Discrete Mathematics for Computer Scientists. (ISBN 0-201-175-649)  
2nd Edition, Addison Wesley 1998.

## **BCA 1009 PHYSICS – I**

### ***Waves and Oscillations***

Wave motion: Longitudinal and transvers waves, wave equation, plane waves, phase velocity, wave packets and group velocity, superposition of waves, equation of motion of simple harmonic oscillator and solution, damped harmonic motion, forced oscillations. (6).

### ***Fields***

Vector and scalar fields, gradient, divergence and curl (Cartesian coordinates only), Gauss's theorem and Stokes' theorem (Statements only). (5)

### ***Electromagnetic Theory***

Gauss's law in integral and differential form, electric potential and relation with E (SS\* - capacitance and electric energy density), dielectrics, three electric vectors, dielectric susceptibility boundary conditions and E and D. (5)

Amper's law in integral and differential form, applications, Hall effect, Three magnetic vectors, magnetic permeability and susceptibility, Boundary conditions on B and H.(5)

Faraday's law in integral and differential form, (SS – Inductance, Magnetic energy density, continuity equation for charge), Displacement current, Maxwell's equations in free space, electromagnetic wave equation for plane waves in a conducting medium, relation between E,B and K, Poynting vector. (5)

### ***Plasma Physics***

Plasma State, Types of plasma, applications of plasma.

### ***Physical Optics***

***Interferences*** : Two – Beam Interference, Interference in Thin Films and Wedge-Shaped Layers, Reflection and Anti-Reflection Coatings, Applications of Interferometry : Newton's rings, Michelson's Interferometer. (5)

***Diffraction***: Fraunhofer Diffraction by Single Slit, Double Slit and Grating, Limit of Resolution, Rayleigh Criterion and Fresnel Diffraction (Qualitative),

***Polarization***: Polarization of light, Malus's law, polarization by reflection, Brewster's law, Double refraction, Analysis of linearly and circularly polarized light, Fresnel's equations and their applications. (7)

SS\* - Self Study

### ***Text Books***

1. Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford Univ. Press. (2001)
2. A. Ghatak, Optics, TMH (1992).
3. Resnick, Halliday and Krane, Physics Part-I & II, John Wuley, 5th Ed. (2002)
4. M.R. Srinivasan, Physics for Engineers, New Age International, 1996
5. H.J. Pain, The Physics Vibrations and Waves.

# **B.C.A. (Bachelor of Computer Application)**

## **Semester - II**

### **BCA 2001 MATHAMETICS - II**

#### ***Abstract Algebra:***

Group, Subgroups, Ring, Integral Domain, Field and Introduction of Boolean Algebra.

#### ***Linear Algebra:***

Spaces and Subspaces, Basic and Dimension of Vector Spaces, Linear Transformation, Their Nullity and Rank.

#### ***Matrix Algebra:***

Elementary Transformation, Inverse of a Matrix by Row Operation, Rank, Solution of a System of Linear Simultaneous Equation by Matrix Methods, Eigen Values and Eigen Vectors, Quadratic Forms.

#### ***Analytical Geometry of 3-Dimensions:***

Rectangular, Spherical, polar and Cylindrical Coordinates, Direction Cosines, Planes, Straight Lines, Shortest Distance between Two Skew Lines, Sphere.

#### ***Text Books:***

1. "Modern Algebra" By A.R.Vasishtha. Krishna Prakashan Media (P) Ltd Meerut.
2. "Matrices" By A.R.Vasishtha. Krishna Prakashan Media (P) Ltd Meerut .
3. "Analytical Geometry of The Dimensions" By Dasguta Prasad, Bharti Bhawan
4. "Advanced Course in Modern Algebra" By Prof Dr.K.K.Jha, New Bharat Prakashan Delhi- 6.
5. "Krishna Series" Analytical Geometry of three Dimension" By A.R.Vasishtha. Krishna Prakashan Media (P) Ltd Meerut .

## **BCA 2002 DATA STRUCTURE & C++**

### ***Introduction to C++:***

A First look at a C++ Program, Variables and Constants, Arithmetic Expressions, Arrays, Logical Expressions and if-else Statements, Iterative Statements, The switch Statement, Pointers, References, Dynamic Memory Allocation, Strings, Structures.

### ***Linked List:***

Data Structures and Abstract Data Types, Linked List Data structure, Linked List Traversal, The Insert Function, Remove Function, Linked Lists vs. Arrays, Linked Lists with a Tail and Doubly Linked Lists.

### ***Stacks:***

Introduction, Array Implementation of Stack, The Hardware Stack

### ***Classes:***

Introduction, Public and Private Members, Encapsulation, Implementation of a Class, Syntax for Accessing Class Members, Constructors and Destructors, Arrays of Class Objects, Operator Overloading for Classes, Classes and Efficiency.

### ***Recursion:***

Introduction, Examples of Recursive Functions, Base Case and Recursive Case, When Not to Use Recursion, Understanding and Debugging Recursive Functions.

### ***Queues:***

Introduction, Ring Buffer and Linked List Queue Implementations.

### ***Trees:***

Introduction, Binary Search Trees, The Destroy, Find, and Insert Functions for Binary Search Trees, The Remove Function for the Binary Search Tree, Binary Tree Traversals, Implementing Tree as a Class.

### ***Searching And Sorting:***

Introduction, Sequential and Binary Search, Selection Sort, Insertion Sort, Bubble Sort, Mergesort, Quicksort, Treesort and Heapsort, Radix Sort.

### ***Text Book:***

1. M.Litvin & G.Litvin- Programs with C++ and Datastructures-Vikas Publishing Home, New Delhi, 2005.

### ***Reference Books:***

1. S.Sahni- Data Structures, Algorithms and Applications in C++, 2<sup>nd</sup> Edn. Universities Press , India , 2005.

## **BCA 2003 DATABASE MANAGEMENT SYSTEM**

### ***Database System Concepts & Architecture:***

Data Independence , Schemas, Instances, Database Languages, Database System Environments Data Models, Basic Structure of Oracle System, Storage Organization in Oracle.

### ***Data Modeling:***

Use of High –level Conceptual Data Models, ER Diagrams, Subclasses, Superclasses and Inheritance, Specialization & Generalization, Conceptual Object Modeling using UML Class Diagrams, Knowledge Representation Concepts, Exercises.

### ***Relational Data Model:***

Relational Constraints, Domain Constraints, Key Constraints Referential Integrity Constraints, Relational Algebra, Fundamental Operations of Relational Algebra & their Implementation, Interdependence of Operations, Example Queries.

### ***ER and EER to Relational Mapping:***

Mapping EER Model Concepts to Relation, Tuple Relational Calculus, Domain Relational Calculus Queries.

### ***Database Design:***

Functional Dependencies, Irreducible Sets of Dependencies, Nonloss Decomposition, 1<sup>st</sup>, 2<sup>nd</sup> & 3<sup>rd</sup> NF, Dependency Preservation, Boyce Codd NF, Multivalued Dependency & 4<sup>th</sup> NF, Join Dependency & 5 NF, Domain Key Normal Form, Restriction –Union Normal Form, Denormalization.

### ***Query Processing And Optimization:***

#### ***SQL-***

Basic Queries in SQL, Subqueries, Retrieving a Query Plan – Table Space Span & I/O, Index Scan, Equal Unique Index Lookup, Clustered vs. Non Clustered Indexing, Index Only Scan, Methods for Joining Tables –Nested Loop Join Merge Join, Hybrid Join, Multiple table Join, Transforming Nested Queries to Joins, Object Relational SQL, Procedural SQL, Introduction to Embedded SQL.

#### ***TRANSACTION-***

Schedules, Serializability, Precedence Graph, Concurrency Control Techniques, Implementation of Transaction in Programs, Cursors and Transaction, Dynamic SQL, Locking Levels of Isolation, Recovery, Checkpoints.

### ***Database Security & Authorization:***

Specifying Privileges, Revoking Privileges, Propagation of Privileges, Statistical Database Security.

***Text Books:***

1. Fundamental of Database Systems- Elmasri Navathe- Pearson Education Asia
2. Database- Principles, Programming and Performance- Parick O' Neil Elizabeth O' Niel, Harcourt Asia PTE Limited

***References Books:***

1. An Introduction to Database Systems- C.J.Date, Addison Wesley, Pearson Education Press
2. Database System Concepts- Abraham Silberschat, Henry F. Korth, S.Sudarshan, Tata McGraw Hill.

## **BCA 2004 LINUX PROGRAMMING**

**Introduction:** The Linux/Unix File Model, The Linux/Unix Process Model, Standard C vs. Original C, Why GNU Programs Are Better.

**Arguments, Options, And The Environment:** Option and Argument Conventions, Basic Command-Line Processing, Option Parsing: getopt() and getopt\_long (), The Environment.

**User-Level Memory Management:** Linux/Unix Address Space, Memory Allocation, Library Calls: malloc(), calloc(), realloc(), free(), String Copying: strdup(), System Calls: brk() and sbrk(), Lazy Programmer Calls: alloca (), Address Space Examination.

**Files And File I/O:** Introduction the Linux/Unix I/O Model, Presenting a Basic Program Structure, Determining What Went Wrong, Doing Input and Output, Random Access: Moving Around within a File, Creating Files, Forcing Data to Disk, Setting File Length.

**Directories And File Metadata:** Considering Directory Contents, Creating and Removing Directories, Reading Directories, Obtaining Information about Files, Changing Ownership, Permission, and Modification Times.

**General Library Interfaces-Part 1** Times and Dates, Sorting and Searching Functions, User and Group Names, Terminals: isatty ().

**Filesystems And Directory Walks:** Mounting and Unmounting Filesystems, Files for Filesystem Administration, Retrieving Per-Filesystem Information, Moving Around in the File Hierarchy, Signals for Interprocess Communication, Important Special-Purpose Signals, Signals Across fork () and exec ().

**Permissions And User And Group Id Numbers:** Checking Permissions, Retrieving User and Group Ids, Checking As the Real User: access (), Checking as the Effective User: edidaccess () (GLIBC), Setting Extra Permission Bits for Directories, Setting Real and Effective IDs, Working with All Three IDs: getresuid () and setresuid () (Linux).

### **Text Book:**

1. A. Robbins- Linux Programming by Example- Pearson Education, New Delhi- 2005

### **Reference Books:**

1. J.Goerzen- Linux Programming Bible, IDG Books, New Delhi- 2001
2. N.Mathew & R.Stones- Beginning Linux Programming Wiley Publishing India , 2004.

## **BCA 2005 MANAGERIAL ECONOMICS**

Meaning, nature, scope and significance of economics Consumer Behaviour. Utility approach, Law of diminishing marginal utility. Law of equip marginal utility. Indifference curve approach, Consumer equilibrium income, prices & substitution effects. Revealed preference theory of law of Demand, Elasticity of demand and its measurements, methods of Demand forecasting, Concepts of cost and revenue, Short run and long run cost curves, Concept of total, average and marginal revenues. Relationship between average revenue, marginal revenue and elasticity of demand. Price determination under perfect, oligopoly, duopoly, monopoly, monopolistic competition price discrimination. Investment decision – capital building, public investment decision, risk and uncertainty

### ***Reference Books:***

1. **Elements of Economics** – Dewett & Dewett
2. **Managerial Economics** – Vartshney & Maheswari
3. **Managerial Economics** – J.G.Verma
4. **Economical Analysis for Management Decisions** – T.W.Elliot
5. **Business Economics** – V.G.Mankar
6. **Managerial Economics** – N.F. Dufty

## Additional Optional Courses

### BCA 2008 CHEMISTRY

**Chemical Bonding:** Trends in periodic properties (ionization energy, electron affinity, electro negativity), VBT, VSEPR theory, MOT for diatomic molecules and polyatomic molecules, coordination complexes & ligands, CFT, colour and magnetism of coordination complexes, spectrochemical series. (8)

**Kinetics and catalysis:** Kinetics of chain reactions, parallel reactions, side reactions, fast reactions in solutions, flash photolysis, kinetics of catalytic action (acid base catalysis, biological catalysis), application of catalyst in industrially important processes (Haber's processes, Ostwald process, Bergius process) (6)

**Thermo-chemistry and Fuels:** Hess's law, entropy, enthalpy and combustion calculations, characterization and application of fossil fuels, solid fuel (carbonization & gasification), liquid fuels (refining, reforming, petrol & diesel, knocking characteristics, octane and cetane number) and gaseous fuels (water gas, producer gas, coal gas and biogas), lubricants and its properties. (8)

**Electrochemistry and corrosion sciences :** Redox process cell, potential and free energy, galvanic cells, electrolysis and Nernst's equation, Fuel cells, and its applications, chemical and electrochemical corrosion, general methods of corrosion prevention (with brief introduction to chemistry of paints, varnishes and enamel) (6)

**Fundamentals of spectroscopic techniques:** Basic principles of vibrational, rotational and Mossbauer spectroscopy. (6)

**Macromolecules:** Classification, Addition and Condensation polymers, molecular weight of polymers ( $M_n$ ,  $M_w$ ,  $M_v$ ), glass transition temperature ( $T_g$ ), structure property relationship in polymers (chemical, electrical, optical and mechanical), examples and use of inorganic polymers, synthesis of some commercially important polymers and their use (Nylon 6, 6, PE, PET, PS) (6)

**An introduction to computational chemistry**  
(5)

#### **Text Books :**

1. Applied chemistry a text book for engineers and technologist, H.D. Gesser, Plenum Publishers.
2. Physical Chemistry: P.W. Atkins
3. Inorganic Chemistry : J.D. Lee
4. Fundamentals of molecular spectroscopy : C.N. Banwell, TMH publication
5. Computational Chemistry : E. Lewars, Kluwer publication
6. Engineering Chemistry : Sashi Chawla

## **BCA 2009 PHYSICS – II**

### ***Special Theory Of Relativity***

Postulates, Galilean Transformations, Lorentz Transformations, Length Contraction, Time Dilation, Velocity Addition, Mass Change and Einstein's Mass Energy Relation.

### ***Quantum Mechanics***

Planck's Theory of Black-Body Radiation, Compton Effect, Wave Particle Duality, De Broglie Waves, Phase velocity, group velocity, Davisson and Germer's Experiment, Uncertainty Principle, Physical Interpretation of Wave Function and its Normalization, Expectation Value.

Schrodinger Equation in One Dimension, Solutions of Time-Independent Schrodinger Equation for Free Particle in an Infinite Square Well, Potential Barrier and Tunneling, Hydrogen atom. (qualitative)

### ***Statistical Physics And Thermodynamics:***

Zeroth law, First law, Second law, statement of second law, Reversibility and Carnot's Theorem, Entropy, Heat Transfer, Steady state one-dimensional Heat conduction.

Statistical Equilibrium, Distribution Laws, Comparison of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Distributions.

### ***Lasers and Applications***

Emission of Light by Atoms, Spontaneous and Stimulated Emission, Einstein's A and B Coefficients, Laser: Population-Inversion, Properties of laser radiation, Ruby & He-Ne Lasers, Applications of Lasers, Elementary Ideas of Holography and Fiber Optics.

### ***Nuclear Physics***

Nuclear Forces, Binding Energy, Liquid Drop Model, Fission, Nuclear Reactors, Fusion and Energy Processes in Stars, Controlled Thermonuclear Reactions.

### ***Text Books:***

1. Resnick, Halliday and Krane, Physics Part-II John Wiley, 5th Ed. (2002).
2. A . Beiser, Perspectives of Modern Physics, Mc Graw Hill Int, Ed. 2002.
3. W. D. Callister, Material Science and Engineering: An Introduction, John Wiley 1997.
4. Sen, Introduction to Plasma Physics.
5. F.F.Chen, Introduction to Plasma Physics, Wiley Eastern.

# **(B.C.A) Bachelor of Computer Application**

## **SEMESTER -III**

### **BCA 3001 PROBABILITY & STATISTICS**

**Probability:** Introduction, Events & Different Types of Events, Addition & Multiplication Law, Conditional Probability, Bay's Theorem.

**Probability Distribution:** Random Variables, Probability Function, Binomial Poison & Normal Distribution.

**Statistics:** Definition, Function & Scope of Statistics.

**Measures of Central Tendency:** Arithmetic Mean, Weighted A.M., Median, Mode, Geometric & Harmonic Mean and Their Merits & Demerits.

**Measures of Variation:** Range, The Interquartile Range or Quartile Deviation, Average (Mean), Deviation Standard Deviation, Coefficient of Variation, Skew ness, Moments & Kurtosis.

**Correlation Analysis:** Introduction, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient.

**Regression Analysis:** Difference Between Correlation & Regression, Regression Lines, Regression Equations, Regressions Coefficient.

**Sampling Distribution:** Chi Square ( $X^2$ ) Distribution and Its Properties, Chi - Square Test, Application of Chi -Square Distribution: Chi-Square Test for Population Variance, Chi- Square Test of Goodness of Fit, Independence of Attributes, T- Distribution & Its Properties, Application of T - Distribution to Testing Hypothesis About Population Mean, Difference Between Two Means, Correlation Coefficient, F- Distribution.

#### **Text Books:**

1. S.P. Gupta & M.P. Gupta, "Business Statistics", Sultan Chand & Sons.
2. S.C. Gupta & V.K. Kapoor, "Fundamental of Mathematical Statistics", Sultan Chand & Sons.

## **BCA 3002 LOGIC DESIGN**

**Binary Systems:** Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

**Boolean Algebra and Logic Gates:** Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operating, Digital Logic Operations, Digital Logic Gates, Integrated Circuits.

**Gate - Level Minimization:** The Map Method, Four - Variable Map, Five - Variable Map, Product of Sums Simplification, Don't - Care Conditions, NAND and NOR Implementations, Other Two- Level Implements, Exclusive - OR Function.\

**Combinational Logic:** Combinational Circuits? Analysis Procedure, Design Procedure, Binary Adder - Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers

**Synchronous Sequential Logic:** Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure.

**Registers and Circuits:** Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters.

**Memory and Programmable Logic:** Introduction, Random-Access Memory, Memory Decoding, Error Detection and Correction, Read-Only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

### **Text Book:**

1. M.Morris Mano- Digital Design, 3rd Edn, Pearson Education, New Delhi - 2005.

### **Reference Book:**

1. A.B.Marcovitz- Introduction to Logic Design, TMH, New Delhi - 2002.

## **BCA 3003 ELECTRONIC COMMERCE & APPLICATIONS**

***Introduction to E-commerce:*** E-commerce: The revolution is just beginning, The visions and forces behind E-commerce, Understanding E-commerce.

***E-commerce business models and concepts:*** E-commerce business models, Major business-to-consumer (B2C) business models, Major business-to-business (B2B) business models, Business models in emerging E-commerce areas, How the internet and the Web change business.

***E-commerce infrastructure:*** The Internet: Technology background, The internet today, The world wide web.

***Building an E-commerce web site:*** A systematic approach, choosing server software, choosing the hardware for an E-commerce site, other E-commerce site tools.

***Security and Encryption:*** The E-commerce security environment, Security threats in the E-commerce environment, Technology solutions, Policies, Procedures and Laws.

***E-commerce payment systems:*** Payment systems, Credit card E-commerce transactions, E-commerce digital payment systems in the B2C arena, B2B payment systems.

***Ethical, Social, and Political issues in E-commerce:*** Understanding ethical, social, and political issues in E-commerce, Privacy and information rights, Intellectual property rights, Governance, Public safety and welfare.

### ***Text Book:***

1. K.C. Laudon & e.G. Traver, E-commerce, Pearson Education, 2003

### ***Reference Books:***

1. R. Kalakota & A.B. Whilston-' Frontiers of Electronic Commerce, Pearson Education- 2006.
2. K.K. Bajaj & D. Nag- E-Commerce, Tata McGraw Hill, New Delhi , Second Edition.

### 3. BCA 3004 PROGRAMMING IN JAVA

**Java Evolution and Overview of Java Language:** How Java differs from C and C++, Java and Internet, Java and World Wide Web, Introduction, Simple Java Program, More of Java, An Application with Two Classes, Java Program Structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style.

**Constants, Variables, and Data Types:** Introduction, Constants, Variables, Data Types, Declaration of Variables, Giving Values of Variables, Scope of Variables, Symbolic Constants, Type Casting, Getting Values of Variables, Standard Default Values.

**Operators and Expressions:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evolution of Expressions, Precedence of Arithmetic Operators, Type Conversion in Expressions, Operator Precedence and Associativity, Mathematical Functions.

**Decision Making and Branching:** Introduction, Decision Making with if Statement, Simple if Statement, The if... else Statement, Nesting of if ... else Statements, The else if Ladder, The switch Statement, The ?: Operator.

**Decision Making and Looping:** Introduction, The while Statement, The do Statement, The for Statement, Jumps in Loops, Labelled Loops.

**Classes, Objects and Methods:** Introduction, Defining a Class, Adding Variables, Adding Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Inheritance: Extending a. Class, Overriding Methods, final Variables and Methods, Final Classes, Finalizer Methods, Abstract Methods and Classes, Visibility Control.

**Arrays, String and Vectors:** Arrays, One-Dimensional Arrays, Creating an Array, Two-Dimensional Arrays, Strings, Vectors, Wrapper Classes.

**Interfaces: Multiple Inheritance:** Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables.

**Packages:** Putting Classes Together: Introduction, Java API Packages, Using system Packages, Naming Conventions, Creating Packages, Accessing a Packages, Using a Package, Adding a Class to a Package, Hiding Classes.

**Multithreaded Programming:** Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization.

**Managing Errors and Exceptions:** Introduction, Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging.

***Applet Programming:*** Introduction, How Applets Differ from Application, Preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable Applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, More About AppletTag, Passing Parameters to Applets.

***Managing Input/Output Files in Java:*** Introduction, Concepts of Streams Stream Classes, Byte Stream Classes, Character Stream Classes, Using Streams, Other Useful I/O Classes, using the File Class, Input/Output Exceptions, Creation of Files.

***Text Book:***

1. E. Balagurusamy, Programming with Java, A Primer Second Edition, Tata McGraw Hill, New Delhi .

***Reference Books:***

1. H.M.Deitel & P.J.Deitel- JA V A- How to Program, 5th Edn, Pearson Education, New Delhi-2004.
2. P.Naughton and H. Schildt-JAVA: The Complete Reference, TMH, New Delhi 2005.
3. D.Jana- Java and Object Oriented Programming Paradigm, PHI, New Delhi-2005.

## **BCA 3005 PROGRAMMING IN VISUAL BASIC**

***Integrated Development Environment:*** Introduction, Integrated Development Environment Overview, Project Window, Toolbox, Form Layout Window, Properties Window, Menu Bar and Tool Bar, A Simple Program: Displaying a Line of Text.

***Introduction to Visual Basic Programming:*** Introduction, Visual Programming and Event-Driven Programming, A Simple Program: Printing a Line of Text on the Form, Another Simple Program: Adding Integers, Memory Concepts, Arithmetic, Operator Precedence, Decision Making: Comparison Operators.

***Control Structures:*** Introduction, Algorithms, Pseudocode, Introduction to Control Structures, If/Then Selection Structure, If/Then/Else Selection Structure, While Repetition Structure, Do While Repetition Structure, Do Until Repetition Structure, Essentials of Computer- Controlled Repetition, For Repetition Structure, Examples Using the For/Next Repetition Structure, Select Case Multiple-Selection Structure, Do/Loop While Repetition Structure, Do/Loop Until Repetition Structure, Exit Do and Exit For Statements, Data Type Boolean, Constant Variables, Logical Operators, Structured Programming Summary, Visual Basic Data Types.

***Sub Procedures and Function Procedures:*** Introduction, Form Modules, Sub Procedures, Function Procedures, Call-by-Value vs. Call-by-Reference, Exit Sub and Exit Function, Storage Classes, Scope Rules.

Arrays: Introduction, Arrays, Declaring Arrays, Examples Using Arrays, Passing Arrays To Procedures, Sorting Arrays, Searching Array: Linear Search and Binary Search, Multidimensional Arrays, Control Arrays, Dynamic Arrays, Variable Arguments: ParamArray, Function Array.

***Strings, Dates and Times:*** Introduction, Fundamentals of Characters and Strings, String Data Type, String Concatenation with & and +, Comparing Character Strings, Operator Like, Manipulating the Individual Characters in a String: Mid\$, Left\$, Right\$, and InStr, Searching for Substrings in String Using InStr and InStrRev, Ltrim\$, Rtrim\$, and Trim\$, Sting\$ and Space\$, Replacing Substrings in a String with Function Replace, Reversing Strings with Function StrReverse, Converting Strings to Uppercase and Lowercase, Conversion Functions, String Formatting, Date and Time Processing, Date and Time Formatting, String Arrays.

***Basic Graphical User Interface Concepts:*** Introduction, Controls, TextBox Control, MaskEdit Control, ComboBox Control, ListBox Control, Scrollbars, Slider Control, Menus, Pop-Up Menus, Function MsgBox.

***Advanced Graphical User Interface Concepts:*** Introduction, Multiple Document Interface (MDI), Multiple Forms.

***Mouse and Keyboard:*** Introduction, Changing the Shape of the Mouse Pointer, Mouse Events, Mouse Buttons, Shift, Ctrl and Alt Keys, Drag-and-Drop, Key Events, KeyPreview Property.

***Error Handling and Debugging:*** Introduction, When Error Handling Should be Used, A Simple Error-Handling Example: Divide by Zero, Nested on Error Statements, Err Object, Resume Statement.

***Text Book:***

1. Deitel & Deitel & T.R. Nieto-Visual Basic 6 How to Program, Pearson Education, New Delhi-2005.

***Refernce Book:***

1. Content Development Group, Visual Basic 6, Tata McGraw Hill, New Delhi.

## **BCA 3008 BASIC ELECTRONICS**

**Introduction:** The Three Kinds of Formulas, Approximations, Voltage Sources, Current Sources, Thevenin's Theorem, Norton's Theorem, Troubleshooting.

**Semiconductors:** Conductors, Semiconductors, Silicon Crystals, Intrinsic Semiconductors, Two Types of Flow, Doping a Semiconductor, Two Types of Extrinsic Semiconductors, The Unbiased Diode, Forward Bias, Reverse Bias.

**Diode Theory:** Basic Ideals, The Ideal Diode, The Second Approximation, The Third Approximation.

**Diode Circuits:** The Half-Wave Rectifier, The Transformer, The Full-Wave Rectifier, The Bridge Rectifier.

**Bipolar Transistors:** The Unbiased Transistor, The Biased Transistor, Transistor Currents, The CE Connection.

**Transistor Fundamentals:** Variations in Current Gain, The Load Line, The Operating Point, Recognizing Saturation, The Transistor Switch, Emitter Bias.

**AC Models:** Base-Biased Amplifier, Emitter-Biased Amplifier, Small-Signal Operation.

**Voltage Amplifiers:** Voltage Gain, The Loading Effect of Input Impedance.

**MOSFETs:** The Depletion-Mode MOSFET, The Enhancement-Mode MOSFET, Multistage Amplifiers, The Ohmic Region, Digital Switching, CMOS, Power FETs.

### **Text Book:**

1. Albert Paul Malvino- Malvino Electron Principles, TMH, Sixth Edition-1999

### **Reference book:**

1. B.P .Singh & R.Singh- Electronic Devices and Integrated Circuits, Pearson Education2006.

## **BCA 3009 LINEAR ALGEBRA**

***Linear Equations and Matrices:*** Linear Systems, Matrices, Dot Product and Matrix Multiplication, Properties of Matrix Operations, Solutions of Linear Systems of Equations, The Inverse of a Matrix, LU-Factorization.

***Determinants:*** Definition and Properties, Cofactor Expansion and Applications, Determinants from a Computational Point of View.

***Vector in  $R^n$ :*** Vector in the Plane, n-Vectors, Introduction to Linear Transformations.

***Real Vector Spaces:*** Vector Spaces, Subspaces, Linear Independence, Basis and Dimension, Homogeneous Systems, The Rank of a Matrix and Applications, Coordinates and Change of Basis, Orthonormal Bases in  $R^n$ , Orthogonal Complements.

***Eigenvalues, Eigenvectors, and Diagonalization:*** Eigenvalues and Eigenvectors, Diagonalization, Diagonalization of Symmetric Matrices.

***Linear Transformations and Matrices:*** Definition and Examples, The Kernel and Range of a Linear Transformation, The Matrix of a Linear Transformation.

### ***Text Book:***

1. R.Kolman & D.R.Hill- Linear Algebra With Applications, Pearson Education, Seventh Edition- 2003.

### ***Reference Book:***

1. S.Singh-Linear Algebra, Vikas Publication, New Delhi-2000.

# **B.C.A. (Bachelor of Computer Applications)**

## **SEMESTER - IV**

### **BCA 4001 SCIENTIFIC COMPUTING**

***Errors in Numerical Calculations:*** Numbers and their accuracy, Errors and their Computations- Absolute, Relative and Percentage, General Error Formula.

***Solution of Algebraic and Transcendental Equations:*** Introduction, Bisection method, Iteration method, Method of False Position, Newton- Raphson method, Graeffe's Root-Squaring method.

***Interpolation:*** Introduction, Errors in Polynomial Interpolation, Finite Differences- Forward, Backward and Central, Detection of errors using Difference tables, Differences of a Polynomial, Newton's formulae for Interpolation, Central Difference Interpolation Formulae- Gauss's Central Difference Formula, Stirling's and Bessel's Formulae, Interpolation with unevenly spaced points, Lagrange's Interpolation Formula, Divided Differences and their properties- Newton's General Interpolation Formula, Inverse Interpolation.

***Numerical Differentiation and Integration:*** Introduction, Numerical Differentiation and Errors, Numerical Integration – Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Weddle's Rule, Romberg Integration, Newton- Cotes Integration Formulae.

***Numerical Solution of Linear System of Equations:*** Direct Methods- Matrix Inversion Method, Gauss-Jordan Method, Gauss Elimination Method, Method of Factorization, Ill-conditioned Linear System, Iterative Method- Gauss- Jacobi Method, Gauss-Seidel Method, Eigen Value Problem.

***Numerical Solution of Ordinary Differential Equations:*** Solution by Taylor's Series, Euler's method, Modified Euler's method, Runge-Kutta method of 2<sup>nd</sup> and 4<sup>th</sup> order, Predictor- Corrector methods- Milne's method, Adam-Moulton method.

***Text Book:***

S.S.Sastry -Introductory methods of Numerical Analysis,4<sup>th</sup> Edition, Prentice Hall of India, New Delhi , 2006

***Reference Books:***

1. V.N.Vedamurthy et.al.-Numerical Methods, Vikas Publishing House, New Delhi , 2005.
2. B.S.Grewal- Numerical Methods in Engineering & Science, Khanna Publishers, Delhi ,2005.

## **BCA 4002 OPERATING SYSTEMS**

**Introduction:** What is an Operating System? Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real- Time Systems.

**Computer-System Structures:** Operation, I/O Structure, Storage Structure, Storage Hierarchy.

**Operating-System Structures:** System Components; Operating-System Services; System Calls; System Programs; System Structure, System Design and Implementation, System Generation.

**Processes:** Process Concept; Process Scheduling, Operations On Processes.

**CPU Scheduling:** Basic Concepts; Scheduling Criteria; Scheduling Algorithms.

**Storage Management:** Memory Management- Backward, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging.

**File-System Interface:** File Concept; Access Methods; Directory Structure; Protection.

**File-System Implementation:** File-System Structure; File-System Implementation; Directory Implementation; Allocation Methods, Free-Space Management.

**Mass-Storage Structure:** Disk Structure; Disk Scheduling; Disk Management; Swap-Space Management.

**Protection:** Goals Of Protection; Domain Of Protection; Access Matrix; Implementation Of Access Matrix; Revocation Of Access Rights.

**The Linux System:** History; Design Principles; Kernel Modules; Process Management; Scheduling; Memory Management; File Systems; Input And Output; Security.

### **Text book:**

1. Silberschatz et.al.-Operating System Concepts , 6<sup>th</sup> Edition, John Wiley Inc., 2003

### **Reference books:**

1. H.M. Deitel -Operating Systems , 6<sup>th</sup> Edition, Pearson Education, 2006
2. D.M. Dhandhare - Operating Systems, 2nd Edition, Tata McGraw Hill, New Delhi, 2006

## **BCA 4003 SOFTWARE ENGINEERING PRINCIPLES**

***Introduction to Software Engineering:*** Characteristics, Emergence of Software Engineering, Software Metrics & Models, Process & Product Metrics.

***Software Life Cycle Models:*** Waterfall, Prototype and Spiral Models and their Comparison.

***Software Project Management:*** Size Estimation- LOC and FP Metrics, Cost Estimation- Delphi and Basic COCOMO, Introduction to Halstead's Software Science, Staffing Level Estimation- Putnam's Model.

***Software Requirements Specification:*** SRS Documents, their Characteristics and Organization.

***Software Design:*** Classification, Software Design Approaches, Function Oriented Software Design, Structured Analysis- Data flow Diagrams and Structured Design, Introduction to Object Oriented Design.

***Coding and Testing of Software:*** Unit Testing, Block Box Testing, White Box Testing, Debugging, Program Analysis Tools, System Testing.

***Software Reliability and Quality Assurance: Reliability Metric- Musa's Basic Model.***

***Software Quality Assurance:*** ISO 9000 and SEI CMM and their Comparison.

***Software Maintenance:*** Maintenance Process Models and Reverse Engineering, Estimation of Maintenance Costs.

***Software Development Tools:*** Introduction to "Rational Rose".

### ***Text Book:***

1. Rajib Mall -Fundamentals of Software Engineering, Prentice Hall of India, New Delhi, 2005

### ***Reference Book:***

1. Pankaj Jalote- An Integrated Approach to Software Engineering, 3<sup>rd</sup> Edition, Narosa Publishing House, New Delhi ,2005
2. Richard Fairley- Software Engineering Concepts, Tata McGraw Hill, New Delhi , 2006

## **BCA 4004 COMPUTER ARCHITECTURE & PROGRAMMING**

***Register Transfer and Micro Operations:*** Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Microoperations, Logic Micro Operations, Shift Micro Operations.

***Basic Computer Organization and Design:*** Instruction Codes, Computer Registers, Computer Instruction, Timing and Control, Instruction Cycle, Memory Reference Instruction, Input-Output Interrupt, Design of Basic Computer, Design of Accumulator Logic.

***Programming the Basic Computer:*** Introduction, Machine Language, Assembly Language, Assembler, Program Loops, Programming Architecture and Logic Operation, Subroutines, Input-Output Programming.

***Central Processing Unit:*** Introduction, General Register Organization, Stack Organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

***Computer Arithmetic:*** Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithm, Floating-Point Arithmetic Operation, Decimal Arithmetic Unit.

***Input-Output Organization:*** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access, Input-Output Processor.

***Memory Organization:*** Memory Hierarchy, Associative Memory, Cache Memory, Virtual Memory.

### ***Text Book:***

1. M.Morris Mano-Computer System Architecture, 3<sup>rd</sup> Edition, Pearson Education, New Delhi , 2006.

### ***Reference Books:***

1. W.Stallings- Computer Organization & Architecture, 7<sup>th</sup> Edition, Pearson Education, New Delhi , 2006
2. N. Carter- Computer Architecture, Schaums Outline Series, TMH, New Delhi , 2006

## **BCA 4005 COMPUTER GRAPHICS & MULTIMEDIA**

***Overview of Graphics Systems:*** Video Display Devices, Refresh Cathode Ray Tubes, Raster-Scan and Random-Scan Systems, Input Devices, Hard-Copy Devices and Graphics Software.

***Output Primitives:*** Points, Line Drawing Algorithms (DDA and Bresenham's Line Drawing Algorithm), Circle- Generating Algorithms (Bresenham's and Midpoint Circle Algorithms), Ellipse-Generating Algorithms (Midpoint Ellipse Algorithm only), Filled-Area Primitives: Scan-Line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm.

***Two- Dimensional Geometric Transformations:*** Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shear, Transformations between Coordinates Systems, Raster Methods for Transformations.

***Two-Dimensional Viewing:*** The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-View Port Coordinate Transformation, Clipping- Point, Line (Cohen-Sutherland Line Clipping and Liang-Barsky Line Clipping and Nicholl-Lee-Nicholl Line Clipping) and Polygon Clipping (Sutherland-Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping).

***Three-Dimensional Geometric Transformations:*** Translation, Rotation, Scaling, Reflection and Shears, Composite Transformations, Modeling and Coordinate Transformations.

***Three- Dimensional Viewing:*** Viewing Pipeline, Viewing Coordinates, Projections and Clipping.

***Multimedia Systems Design:*** Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Multimedia Data Interface Standards, The Need for Data Compressions, Multimedia Database.

***Media and Data Streams:*** Medium, Main Properties of a Multimedia Stream, Multimedia System Definition, Combination of Media.

***Data & File Format Standards:*** Rich-Text Format, TIFF File Format, RIFF, MIDI File Format, JPEG DIB File Format, MPEG Standards.

***Text Books:***

1. D. Hearn & M. P. Baker -Computer Graphics C Version, 2<sup>nd</sup> Edn,Pearson Education, New Delhi , 2006
2. J. F. Koegel Buford -Multimedia Systems, Pearson Education, New Delhi , 2006

***Reference Books:***

1. R.A. Plastock et.al.- Computer Graphics(Schaums Outline Series), 2<sup>nd</sup> Edn, TMH, New Delhi , 2006.
2. J.D.Foley- Computer Graphics, 2<sup>nd</sup> Edn, Pearson Education, New Delhi , 2004

## **BCA 4008 Legal privacy and Security in E-Commerce**

An introduction to the four essential elements of safe electronic commerce: the data transaction, the server, the client, and the host network. Topics include encryption, firewalls, transaction security, securing Web commerce, and Web security risk management.

### ***Text Book :***

1. Garfinkel and Spaffard Publisher, O' Reilly -Web Security and Commerce 2nd Ed, 2004.

## **BCA 4009 Technical Report Writing**

**Introduction:** Definition, Objectives, Stages of Communication, Essentials of Good/Effective Communication, Benefits of Good Communication, Gaps in Communication, Communication and Information Technology.

**Business Correspondence:** Structure of a Letter, Inquiry Letter, Sales Letter, Order Letter, Complaints, Complaint Handling, Telemarketing.

**Government Correspondence :** Noting, Routine Letter, Demi-Official Letter Memorandum, Circular, Telegrams, Newsletter.

**Writing Skills:** Report Writing, Scientific Paper Writing, Writing Small Paragraphs & Essays, Composition.

**Grammar:** Sentence Structure, Idiomatic Usage of Language, Tenses, Direct & Indirect Parts of Speech, Active & Passive Voice, Vocabulary.

**Selected Short Stories :** 2-3 classic short stories, 2-3 great short stories by Indian writers.

**Preparation for Job :** Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions.

### **Text Books:**

1. Richard h Hall-Organisations: Structures, Processes and Outcomes, Prentice Hall India .
2. Yvonne Hoban -English for the Secretary, Tata McGraw Hill, New Delhi .
3. M. Raman & S. Sharma -Technical Communication, Oxford University Press.
4. M.E. Guffey - Business Communication Process and Product, Thomson Learning.

### **Reference Book:**

1. Human Behaviour at Work; John W Newstorm & Keith Davis; Tata McGraw Hill.
2. The Most Common Mistakes in English Usage; Thomas Elliot Berry, Tata McGraw Hill
3. Business Communication: R.K. Madhukar; Vikas Publication.

# **B.C.A. (Bachelor of Computer Applications)**

SEMESTER - V

## **BCA 5001 INTERNET AND WEB TECHNOLOGY**

**Internet Basics:** Basic concepts, Communication on the Internet, Internet Domains, Internet Server Identities, Establishing Connectivity on the Internet, Client IP Address, A Brief Overview of TCP/IP and its Services, Transmission Control Protocol, Web Server , Web Client, Domain Registration

**Introduction to HTML:** HTML, HTML Tags, Commonly Used HTML Commands, Title and Footers, Text Formatting, Text Style, Lists, Adding Graphics to HTML Documents, Tables, Linking Documents, Frames.

**Java Script :** Java Script in Web Pages, Advantages of Java Script, Advantages of Java Script, Data Types and Literals, Type Casting , Java Script Array, Operators and Expression, Conditional Checking , Function, User Defined Function.

**Understanding XML:** SGML,XML, XML and HTML, Modeling XML Data, Styling XML with XSL, XHTML

**Creation of Dynamic Web pages using JSP:** Dynamic Web Page, Introduction of JSP, Pages Overview, JSP Scripting, Standard Action, Page Directive, Include Directive

### ***Text Books:***

1. Ivan Bay Ross- Web Enable Commercial Application Using HTML, DHTML, BPB Publication
2. Michel Morrison -HTML and XML for Beginners, PHI, New Delhi- 2001
3. H.M Dietal and P.J Dietal -Java How to Program, PHI, New Delhi- 2005

### ***Reference Book:***

1. Java Server Side Programming -WROX Publication

## **BCA 5002 ADVANCED DATABASE MANAGEMENT SYSTEM**

***Design Theory for Relational Database:*** Functional Dependencies, Decomposition of Relation Schemes, Normal Forms for Relations. Schemes, Multivalued and other kinds of Dependencies.

***Query Optimization:*** Basic Optimization Strategies, Algebraic Manipulation, Optimization of Selections in System, Exact Optimization for a Subset of Relational Queries, Optimization under Weak Equivalence.

***Database Protection:*** Integrity, Constraints in Query-by-Example, Security, Security in Query-by- Example, Security in Statistical Databases.

***Concurrent Operations on the Database:*** Basic Concepts, A simple Transaction Model, Model with Read- and Write-Locks, Read-only, Write-only Model, Concurrency for Hierarchically Structured Items, Protection against Crashes, Optimistic Concurrency Control.

***Database Recovery Techniques:*** Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm, Recovery in Multidatabase Systems, Database Backup and Recovery from Catastrophic Failures.

### ***Text Books:***

1. J.D.Ullman- Principles of Database Systems, Galgotia, New Delhi .
2. S.Ceri and G. Relagatti- Distributed Databases, McGraw-Hill.

### ***Reference Books:***

1. M.T.Ozsu & P.Valduriez-Principles of Distributed Database Systems, 2<sup>nd</sup> Edn, Pearson Education, New Delhi-2001.
2. Elmasri & Navathe- Fundamentals of Database Systems, 3<sup>rd</sup> Edn, Pearson Education, New Delhi , 2001.

## **BCA 5003 FUNDAMENTALS OF COMPUTER ALGORITHMS**

***Introduction:*** Algorithm and their Complexity, Randomized Algorithm

***Design of Efficient Algorithm:*** Data Structure, Set Representation, Graphs, Trees, Recursion, Divide and Conquer, Balancing, Dynamic Programming.

***Divide- and -Conquer:*** Generate Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort.

***The Greedy Method:*** The General Method, Tree Vertex Splitting Job, Optimal Merge Patterns, Minimum Cost Spanning Trees.

***Data structure for Set Manipulation Problems:*** Fundamental Operations on Set, Hashing Technique, Binary Search Trees, Optimal Binary Search Trees.

***Algorithm on Graphs:*** Depth First Search, Biconnectivity, Depth First Search of a Directed Graph.

***Text Book:***

1. Horowitz E- Computer Algorithms, Galgotia Publication, New Delhi -2000

***Reference Book:***

1. Aho A.V, Hopcroft J.E & Ullman J.D - The Design and Analysis of Computer Algorithm, Addison Wesley, 1998.

## **BCA 5004 FUZZY LOGIC AND APPLICATIONS**

### ***Classical Theories:***

***Crisp Set Theory:*** Introduction, Relation between Sets, Operations on Sets, Characteristic Functions.

***Propositional Logic:*** Introduction, Syntax of PL(1), Semantics of PL(1), Properties Satisfied by then Connectives, Inference Rules.

***Predicate Logic:*** Introduction, Syntax of PL(2), Semantics of PL(2), Properties Satisfied by Connectives and Quantifiers, Resolution in PL(2).

***Boolean Algebra:*** Introduction to Boolean Algebra, Normal Forms, Complete Disjunctive Normal Form (CDNF).

### ***Fuzzy Theories:***

***Fuzzy Set Theory:*** Introduction to Fuzzy set, Relation between Fuzzy Set, Operations on Fuzzy Sets, Properties of the Standard Operations, Certain Numbers Associated with a Fuzzy Set, Certain Crisp Sets Associated with Fuzzy Set, Extension Principle, Fuzzy Set of Type-K and Level-K, Generation of Membership Functions.

***Fuzzy Relations:*** Fuzzy Relations, Operations on Fuzzy Relations,  $\alpha$ -Cuts of a Fuzzy Relations, Composition of Fuzzy Relations, Cylindric Closure, Fuzzy Relation on a Domain.

***Fuzzy Logic:*** Introduction, Three-valued Logics, N-valued Logics for  $N \geq 4$ , Infinite-valued Logic, Fuzzy Logics, Fuzzy Propositions and Their Interpretations in Terms of Fuzzy Sets, Fuzzy Rules and Their Interpretations in Terms of Fuzzy Relations, Fuzzy Inference or Approximate Reasoning, Generalizations of Fuzzy Logics.

### ***Text Book:***

1. M. Ganesh- Introduction to Fuzzy Sets and Fuzzy Logic, PHI, 2004

### ***Reference Books:***

1. Klir G.J. and Yuan B. - Fuzzy Sets and Fuzzy Logic, PHI, 2001.
2. Pedryes W. and Gomide F. - An Introduction to Fuzzy Sets: Analysis and Design, PHI.

## **BCA 5005 MANAGEMENT INFORMATION SYSTEM**

***Introduction to MIS:*** The Technical and Business Perspective, Organization Structure, Evaluation of MIS through Information System, MIS Organization within the Company.

***Information Systems for Decision Making:*** Evolution of an Information System, Basic Information Systems, Decision Making and MIS, Decision Assisting Information System, Concepts of Balanced MIS Effectiveness and Efficiency Criteria.

***Development of MIS:*** Methodology and Tools/Techniques for Systematic Identification, Evaluation and Modification of MIS.

***Advanced MIS:*** Concepts, Needs and Problems in Achieving Advanced MIS, DSS.

***Pitfalls in MIS Development:*** Fundamental Weakness, Soft Spots in Planning and Design Problems

### ***Text Book:***

1. Murdic, Rose and Clagett- Information Systems for Modern Management, PHI, New Delhi .

### ***Reference Book:***

1. Laudon-Laudon- Management Information Systems, Pearson Education, New Delhi .

# **B.C.A. (Bachelor of Computer Applications)**

## **SEMESTER - VI**

### **BCA 6003 OPTIMIZATION THEORY**

***Operations Research-An Introduction:*** Definitions of Operations Research, Characteristics of Operations Research Approach.

***Linear Programming- Applications and Model Formulation:*** Introduction, Structure of Linear Programming Model, Advantages of Using Linear Programming, Limitations of Linear Programming, Applications Areas of Linear Programming, General Mathematical Model of Linear Programming Model, Guidelines on Linear Programming Model Formulation, Examples of LP Model Formulation.

***Linear Programming- The Graphical Method:*** Introduction, Important Definitions, Graphical Solution Methods of LP Problem.

***Linear Programming- The Simplex Method:*** Introduction, Standard Form of an LP Problem, Simplex Algorithm (Maximization Case), Simplex Algorithm (Minimization Case).

***Duality in Linear Programming:*** Introduction, Formulation of Dual Linear Programming Problem, Standard Results on Duality, Managerial Significance of Duality, Advantages of Duality.

***Integer Linear Programming:*** Introduction, Types of Integer Programming Problems, Enumeration and Cutting Plane Solution Concept, Gomory's All Integer Cutting Plane Method, Gomory's Mixed- Integer Cutting Plane Method, Branch and Bound Method, Applications of Zero-One Integer Programming.

***Transportation Problem:*** Introduction, Mathematical Model of Transportation Problem, The Transportation Algorithm, Methods for Finding Initial Solution.

***Assignment Problem:*** Introduction, Mathematical Model of Statement Assignment Problem, Solution Methods of Assignment Problem.

***Project Management-PERT and CPM:*** Introduction, Basic Differences between PERT and CPM, Phases of Project Management, PERT/CPM Network Components and Precedence Relationships, Critical Path Analysis.

***Queuing Theory:*** Introduction, Essential Features of a Queuing System, Performance Measures of a Queuing System, Probability Distributions in Queuing Systems, Classification of Queuing Models, Single- Server Queuing Models, Multi-Server Queuing Models.

***Text Book:***

1. J.K Sharma- Operations Research Theory & Applications, 3<sup>rd</sup> Edn, Macmillan India Ltd., New Delhi-2007.

***Reference Book:***

1. H.A. Taha-Operations Research: An Introduction, Pearson Education, New Delhi , 2006.

## **BCA 6002 DISTRIBUTED COMPUTING**

***Distributed Computing- An Introduction:*** Definitions, The History of Distributed Computing, Different Forms of Computing, The Strengths and Weaknesses of Distributed Computing, Basics of Operating Systems, Network Basics, Software Engineering Basics.

***Interprocess Communications:*** An Archetypal IPC Program Interface, Event Synchronization, Timeouts and Threading, Deadlocks and Timeouts, Data Representation, Data Encoding, Text-Based Protocols, Request-Response Protocols, Event Diagram and Sequence Diagram, Connection-Oriented versus Connectionless IPC.

***Distributed Computing Paradigms:*** Paradigms and Abstraction, Paradigms for Distributed Applications, Trade-offs.

***The Socket API:*** Background, The Socket Metaphor in IPC, The Datagram Socket API, The Stream- Mode Socket API, Sockets with Nonblocking I/O Operations, Secure Socket API.

***The Client-Server Paradigm:*** Background, Client-Server Paradigm Issues, Software Engineering for a Network Service, Connection-Oriented and Connectionless Servers, Iterative Server and Concurrent Server, Stateful Servers.

***Group Communication:*** Unicasting versus Multicasting, An Archetypal Multicast API, Connectionless versus Connection-Oriented Multicast, Reliable Multicasting versus Unreliable Multicasting, The Java Basic Multicast API, Reliable Multicast API.

***Distributed Objects:*** Message Passing versus Distributed Objects, An Archetypal Distributed Object Architecture, Distributed Object Systems, Remote Procedure Calls, Remote Method Invocation, The Java RMI Architecture, The API for the Java RMI, A Simple RMI Application, Steps for Building an RMI Application, Testing and Debugging, Comparison of RMI and Socket APIs.

***Text Book:***

1. M.L.Liu- Distributed Computing: Principles and Applications, 1<sup>st</sup> Indian Reprint, Pearson Education, 2004.

## **BCA 6001 DATA COMMUNICATION & NETWORKING**

***Data Transmission Basic Concepts and Terminology:*** Data Communication Model, Communication Tasks, Parallel & Serial Transmission, Transmission Models, Transmission Channel, Data Rate, Bandwidth Signal Encoding Schemes, Data Compression, Transmission Impairments, Layering and Design Issues, OSI Model, Services and Standards.

***Computer Network:*** Network Topology, Performance of Network, Network Classification, Advantages & Disadvantages of Network, Transmission Media (guided and unguided), Network Architecture, OSI Reference Model, TCP/IP, SNA and DNA.

***Data Line Devices:*** Modems, DSL, ADSL, Multiplexer and Different Multiplexing Techniques: (FDM, TDM).

***Data Link Layer:*** Need for Data Link Control, Frame Design Consideration, Flow Control & Error Control (Flow control mechanism, Error Detection and Correction techniques) Data Link Layer Protocol, HDLC.

***Network Layer:*** Routing, Congestion control, Internetworking principles, Internet Protocols (IPv4 packet format, Hierarchical addressing sub netting, ARP, PPP), Bridges, Routers.

***Physical Layer:*** Function and interface, physical layer standard, null modem.

***Local Area Network:*** Definition of LAN, LAN topologies, Layered architecture of LAN, MAC, IEEE standard. Ethernet LAN, CSMA, CSMA/ CD, Token passing LAN.

***Network Security:*** Security Requirement, Data encryption strategies, authentication protocols, Firewalls.

***Basic Applications:*** Telnet, FTP, NFS, SMTP, SNMP and HTTP.

### ***Text Book:***

1. Prakash C. Gupta -Data Communications & Computer Networks, PHI, New Delhi.

### ***Reference Books:***

1. William Stallings- Data & Communications, 6<sup>th</sup> Edition, Pearson Education.
2. Tanenbaum- Computer Networks, 3<sup>rd</sup> Edition, PHI, New Delhi .

## **BCA 6004 ACCOUNTING AND FINANCE MANAGEMENT**

**Accounting:** Basic of Accounting, Accounting Mechanics- Double Entry System, Classification, Rules for Debit and Credit Concepts & Conventions, Indian Accounting Standards.

**Journal, Ledger and Trial Balance:**

**Journal:** Meaning of Journal, Advantages, Subdivision.

**Ledger:** Meaning, subdivision, Mechanics of Posting, balancing of Ledger accounts

**Trial Balance:** Objectives, Defects of trial balance, Errors disclosed by trial balance, preparation and locating errors.

**Cash Book and Subsidiary books of Accounting:** Kinds of cashbook, Purchase daybook, Sales daybook, Bills receivable book, Bills payable book.

**Finance Accounts:** Trading account,, Profit & Loss account, Adjustments, Balance Sheet, Forms of balance Sheet, Assets and their classification, liabilities and their classification, uses and limitations.

**Capital & Revenue Expenditure & Receipts:** Rules for determining capital expenditure, Deferred Revenue expenditure, Capital & Revenue receipts, Capital & Revenue Profits, Capital & Revenue Loss.

**Nature of Financial Management:** Scope of financial functions, finance functions and job of finance manager, organization of finance function.

**Understanding of Financial statements:** Concept of profit and loss account and balance sheet- significance of their preparation.

**Statement of Changes of financial position:** definition of funds, fund flow statement, cash flow statement.

**Text Books:**

1. Management Accounting – Manmohan Singh and Goel
2. Financial management- Pandey I. M.

**Reference Books:**

1. Hanif & Mukherjee-Modern Accountancy, TMH, New Delhi .
2. Maheshwari & Maheshwari- An Introduction to Accountancy, Vikas Publishing House Pvt.Ltd., New Delhi .

# **ELECTIVES**

**(BCA 6005)**

## **AGILE SOFTWARE DEVELOPMENT PROCESS**

***Introduction Unknowable and Incommunicable:*** The Problem with Parsing Experience, The Impossibility of Communication, Three Levels of Listening.

***A Cooperative Game of Invention and Communication:*** Software and Poetry, Software and Games, A Second Look at the Cooperative Game.

***Individuals:*** Them's Funky People, Overcoming Failure Modes, Working Better in Some Way than Others, Drawing on Success Modes.

***Communicating, Cooperative Teams:*** Convection Currents of Information, Jumping Communication Gaps, Teams as Communities, Team as Ecosystems.

***Methodologies:*** An Ecosystem that Ships Software, Methodology Concepts, Methodologies Design Principles, XP under Glass.

***Agile and Self-Adapting:*** Light but sufficient, Agile, Becoming Self-Adapting

***The Crystal Methodologies:*** Shaping the Crystal Family, Crystal Clear, Crystal Orange, Crystal Orange Web.

***Text Book:***

Cockburn- Agile Software Development, 1<sup>st</sup> Indian Reprint, Pearson Education, 2002

# **DATA MINING & WAREHOUSING**

## **Data Mining:**

**Introduction:** Basic Data Mining Tasks, Data Mining versus Knowledge Discovery in Databases, Data Mining Issues, Data Mining Metrics, Social Implications of Data Mining, Data Mining from a Database Perspective.

**Data Mining Techniques:** Introduction, A Statistical Perspective on Data Mining, Similarity Measures, Decision Trees.

**Classification:** Introduction, Statistical- Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms.

**Clustering:** Introduction, Similarity and Distance Measures, Outliers, Hierarchical Algorithms, Partitional Algorithms(Minimum Spanning Tree, Squared Error Clustering Algorithm, K-Means Clustering, Nearest neighbor Algorithm).

**Association Rules:** Introduction, Large Itemsets, Basic Algorithms

## **Data Warehousing:**

**The Data Warehousing Environment:** The structure of the Data Warehouse, Subject Orientation, Day 1-Day n Phenomenon, Granularity, Exploration and Data Mining, Living Sample Database, Partitioning as a Design Approach, Structuring Data in the Data Warehouse, Auditing and the Data Warehouse, Cost Justification, Data Homogeneity. Heterogeneity, Purging Warehouse Data.

**The Data Warehouse and Design:** Beginning with Operational Data, Data. Process Models and the Architected Environment, The Data Warehouse and Data Models, The Data Model and the Iterative Development, Normalization/Denormalization, Meta Data.

**Granularity in the Data Warehouse:** Raw Estimates, Input to the Planning Process, Data in Overflow? What the levels of Granularity will be, Some feedback loop techniques, Levels of Granularity-Banking Environment.

**The Data Warehouse and Technology:** Managing Large Amounts of Data, Managing Multiple Media, Index/Monitor Data, Interfaces to many technologies, Programmer/Designer Control of Data Placement.

## **Text Books:**

1. M.H. Dunham & S. Sridhar- Data Mining: Introductory and Advanced Topics, Pearson Education, 2006
2. W.H. Inmon- Building The Data Warehouse, 3<sup>rd</sup> Edn, Wiley Dreamtech India(P) Ltd, 2003

***Reference Books:***

1. S. Anahory & D. Murray- Data Warehousing, Pearson Education, New Delhi-2000
2. A.Berson & S.J. Smith- Data Warehousing, Data Mining & OLAP, TMH, New Delhi-2006

# **SYSTEM PROGRAMMING**

***Introduction:*** Evolution of System Programming- Assemblers, Loaders, Operating Systems, Macro processors, Compilers & Interpreters.

***Assemblers:*** Elements of Assembly Language programming, A simple assembly scheme, Pass structure of Assemblers, Design of a Two Pass Assemblers, A Single Pass Assembler for IBM PC.

***Macros and Macro Processors:*** Macro definition and call, Macro expansion, Nested macro calls, Advanced Macro facilities, Design of a Macro Processor,

***Linkers:*** Relocation and linking concepts, Design of a linker, Self-Relocating programs, A linker for MS-DOS, Linking for overlays.

***Loaders:*** Compile and Go Loaders, Absolute loaders, Relocating loaders, Direct Linking Loaders.

***Software Tools:*** Software tools for Program Development, Editors, Debug Monitors, Programming Environments, User Interfaces.

## ***Text Book:***

1. Dhamdhare D.M.- Systems Programming & Operating Systems, 2<sup>nd</sup> Edn, TMH, New Delhi 2006.

## ***Reference Books:***

1. Donovan J.J.- System Programming, TMH, New Delhi, 1993
2. L.L. Beck- System Software: An Introduction to System Programming, 3<sup>rd</sup> Edition, Addison Wesley, India

# **DISTRIBUTED DATABASE SYSTEMS**

***Introduction:*** What is Distributed Database System? Promises of DDBSs, Complicating Factors, Problem Areas.

***Distributed DBMS Architecture:*** DBMS Standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture.

***Distributed Database Design:*** Alternative Design Strategies, Distributed Design Issues, Fragmentation, Allocation.

***Query Decomposition and Data Localization:*** Query Decomposition, Localization of Distribution Data.

***Optimization of Distributed Queries:*** Query Optimization, Centralized Query Optimization, Join Ordering in Fragment Queries, Distributed Query Optimization Algorithms.

***Distributed Concurrency Control:*** Serializability Theory, Taxonomy of Concurrency Control Algorithm, Locking-Based Concurrency Control Algorithms, Timestamp-Based Concurrency Control Algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management, “Relaxed” Concurrency Control.

***Distributed DBMS Reliability:*** Reliability Concepts and Measures, Failures and Fault Tolerance in Distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols.

## **Text Books:**

M. Tamer Ozsu & Patrick- Valduriez- Principles of Distributed Database Systems, 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2001

## **Reference Books:**

1. Elmasari & Navathe: Fundamentals of Database Systems, 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2005
2. A. Silberschatz, Korth- Database Systems Concepts, McGraw Hill.

## **DECISION SUPPORT SYSTEM**

***Introduction to DSS:*** DSS defined, Ingredients of a DSS, Data and Model Management, DSS knowledge base, User Interfaces, The DSS User, Categories and classes of DSSs.

***Decisions and Decision Makers:*** Decision Makers, Decision Styles, Decision Effectiveness, How can a DSS help?, A topologies of Decisions.

***Decision in the Organization:*** Understanding the Organization, Supporting Organizational Decision Making.

***Modeling Decision Process:*** Defining the problem and its structure, Decision Models, Types of Probability, Techniques for forecasting Probabilities.

***Group Decision Support and GroupWare Technologies:*** Group Decision making, The problem with Groups MDM Support Technologies, Managing MDM Activities.

***Expert System and Artificial Intelligence (Intelligent Decision Support Systems):*** The Concept of Expertise, The Intelligence of Artificial Intelligence, The concepts and structure of Expert Systems, Designing and Building Expert Systems, Evaluating the benefits of ES.

***Machines that Can learn:*** Fuzzy Logic and Linguistic Ambiguity, Artificial Neural Networks, Generic Algorithms and Genetically Evolved Networks, Applications of Machines that Learn.

***Designing and Building Decision Support Systems:*** Strategies for DSS Analysis and Design, The DSS Developer, Tools for DSS Development.

***Implementing and Integrating Decision Support Systems:*** DSS Implementation System Evaluation, The Importance of Integration.

***Decision Support in the Twenty-First Century:*** The future of Decision Support Systems, The future of Expert and Artificial Intelligence Systems.

### **Text Book:**

1. George M. Marks- Decision Support Systems in 21<sup>st</sup> Century, 2<sup>nd</sup> Edition, Pearson Education, 2006

### **Reference Book:**

1. Efrain Turban- Decision Support Systems and Intelligence System, 7<sup>th</sup> Edition, Pearson Education 2006.