### BCA

#### BCA - I SEMESTER

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<tr>
<td>MA 1101</td>
<td>Mathematics- I</td>
<td>1.0</td>
<td>BCA 1006</td>
<td>C Programming Lab</td>
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<td>BCA 1002</td>
<td>Introduction to Computer Science</td>
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<td>BCA 1007</td>
<td>IT Lab</td>
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<td>BCA 1003</td>
<td>Programming in C</td>
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<td>BCA 1004</td>
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<td>BCA 1005</td>
<td>Communication Skills/Technical English</td>
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**Addional Optional Course**

- BCA 1008 Discrete Mathematical Structures
- BCA 1009 Physics –I

#### BCA - II SEMESTER

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<tr>
<td>BCA 2001</td>
<td>Mathematics-II</td>
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<td>BCA 2006</td>
<td>Data Structure Lab.</td>
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<td>BCA 2002</td>
<td>Data Structures &amp; C++</td>
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<td>BCA 2007</td>
<td>Database Lab</td>
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<td>BCA 2003</td>
<td>Database Management Systems</td>
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<td>BCA 2004</td>
<td>Linux Programming</td>
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<td>BCA 2005</td>
<td>Managerial Economics</td>
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**Addional Optional Courses**

- BCA 2008 Chemistry
- BCA 2009 Physics - II

#### BCA - III SEMESTER

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<tr>
<td>BCA 3001</td>
<td>Probability &amp; Statistics</td>
<td>1.0</td>
<td>BCA 3006</td>
<td>Java Programming Lab</td>
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<tr>
<td>BCA 3002</td>
<td>Logic Design</td>
<td>1.0</td>
<td>BCA 3007</td>
<td>VB Programming Lab</td>
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<tr>
<td>BCA 3003</td>
<td>Electronic Commerce &amp; Applications</td>
<td>1.0</td>
<td>BCA 3004</td>
<td>Programming in JAVA</td>
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<td>Programming in Visual Basic</td>
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**Additional Optional Courses**

- BCA 3008 Basic Electronics
- BCA 3009 Linear Algebra

#### BCA - IV SEMESTER

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<td>BCA 4001</td>
<td>Scientific Computing</td>
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<td>BCA 4002</td>
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<td>BCA 4007</td>
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<td>BCA 4003</td>
<td>Software Engineering Principles</td>
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<td>BCA 4004</td>
<td>Computer Architecture &amp; Programming</td>
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<tr>
<td>BCA 4005</td>
<td>Computer Graphics &amp; Multimedia</td>
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**Additional Optional Courses**

- BCA 4008 Legal Privacy and Security in E-Commerce
- BCA 4009 Technical Report Writing

#### BCA - V SEMESTER

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<td>BCA 5003</td>
<td>Fundamentals of Computer Algorithms</td>
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<td>BCA 5004</td>
<td>Fuzzy Logic and Applications</td>
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<td>Management Information System</td>
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<tr>
<td>BCA 6001</td>
<td>Data Communication and Computer Network</td>
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<td>Distributed Computing</td>
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<td>Accounting and Finance Management</td>
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**List of Electives**
- Agile Software Development Process
- Data Mining & Warehousing
- System Programming
- Distributed Database Systems
- Decision support System
**Differential Calculus:** Successive differentiation, Leibritiz Theorem, Taylors theorem with Lagranges forms of remainders, Expansion of a function of one variable in Taylors and Meclanrin's infinite series. Maxima and Minima of one variable, partial Derivatives, Euler's theorem, change of variables, total differentiation, Errors and approximation. Taylors 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:**

Introduction To Computers

Number Systems And Logic Gates
Introduction, Number Systems, Conversion between Number Bases, Arithmetic System, Signed and Unsigned Numbers, Concept of Overflow, Binary Coding, Logic Gates, Boolean Algebra, Combination of Logic Gates.

Computer Architecture

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

Secondary Storage
Introduction, Classification of Secondary Storage Devices, Magnetic Tape, Magnetic Disk, Optical Disk, Magneto Optical disk.

Input Devices
Introduction, Keyboard, Pointing Devices, Speech Recognition, Digital Camera, Scanners, Optical Scanners.

Output Devices

Computer Program
Introduction, Developing a Program, Algorithm, Flowchart, Psedocode (P-Code).

Computer Languages
Introduction, Evolution of Programming Languages, Classification of Programming Languages, Generations of Programming Languages, Features of a Good Programming Language, Selection of a Programming Language.

Computer Software

Operating System

Data Communication And Computer Network

Internet Basics
Introduction, Evolution of Internet, Basic Internet Terms, Getting Connected to Internet, Internet Applications, 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:
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.


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 :


Reference:

1. Programming with C, B.S.Gottfried (TMH)
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 warning, ozone depletion, Air (prevention and control of pollution) Act.

Water Pollution: Water resources sources of water pollution, various pollutants, their toxic effect, portability 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, theans to biodiversity, conservation of biodiversity.

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

Recommended Books:
2. Miller T.G.Jr., Environmental Science, Wadswarth Pulishing Co. (TB)
Introduction:

Business Correspondence:

Government Correspondence:

Writing Skills:

Grammar:

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 India.
2. English for the Secretary; Yvonne Hoban; Tata McGraw Hill.

Reference Book:
1. Human Behavior at Work; John W Newstorm & Keith Davis; Tata McGraw Hill.
2. The Most Common Mistakes in English Usage; Thomas Elliot Berry, Tata McGraw Hill
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. 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.

2. FIELDS
Vector and scalar fields, gradient, divergence and curl (Cartesian coordinates only), Gauss’s theorem and Stokes’ theorem (Statements only).

3. 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.

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

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 place waves in a conducting medium, relation between E,B and K, Poynting vector.

4. PLASMA PHYSICS
Plasma State, Types of plasma, applications of plasma.

5. 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.


SS* - Self Study

Text Books
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, Wpolar and Cylindrical Coordinates, Direction Cosines, Planes, Straight Lines, Shortest Distance Between Two Skew Lines, Sphere.

TEXT BOOKS:
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.
INTRODUCTION TO C++:

LINKED LIST:

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:

REFERENCE BOOKS:
DATABASE SYSTEM CONCEPTS & ARCHITECTURE:

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 Calculas, Domain Relational Calculas Queries.

DATABASE DESIGN:
Functional Dependencies, Irreducible Sets of Dependencies, Nonloss Decomposition, 1st, 2nd & 3rd NF, Dependency Preservation, Boyce Codd NF, Multivalued Dependency & 4th 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:

TEXT BOOKS:
1. Fundamental of Database Systems- Elmasri Navathe- Pearson Education Asia

REFERENCES BOOKS:
1. An Introduction to Database Systems- C.J.Date, Addison Wesley, Pearson Education Press
INTRODUCTION:

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 Filesystem Information, Moving Around in the File Hierarchy, Signals for Interprocess Communication, Important Special-Purpose Signals, Signals Across fork () and exec ()

PERMISSIONS, 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 forDirectories, 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:

Reference Books:

1. *Elements of Economics* – Dewett & Dewett
2. *Managerial Economics* – Vartshney & Maheswari
1. **Chemical Bonding**: Trends in periodic properties (ionization energy, electron affinity, electronegativity), VBT, VSEPR theory, MOT for diatomic molecules and polyatomic molecules, coordination complexes & ligands, CFT, colour and magnetism of coordination complexes, spectrochemical series.  

2. **Kinetics and catalysis**: Kinetics of chain reactions, oparallel 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)  

3. **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.  

4. **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)  

5. **Fundamentals of spectroscopic techniques**: Basic principles of vibrational, rotational and Mossbauer spectroscopy.  

6. **Macromolecules**: Classification, Addition and Condensation polymers, molecular weight of polymers (Mn, Mw, Mv), glass transition temperature (Tg), 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)  

7. An introduction to computational chemistry  

**Text Books:**  
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  
1. **SPECIAL THEORY OF RELATIVITY**

2. **QUANTUM MECHANICS**
   
   2.2 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)

3. **STATISTICAL PHYSICS AND THERMODYNAMICS:**


4. **LASERS AND APPLICATIONS**

5. **NUCLEAR PHYSICS**

**TEXT BOOKS:**
**THIRD SEMESTER**

**BCA 3001**  **PROBABILITY & STATISTICS**  **1.0**

**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 (X²) 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:**
**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.


**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:**

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


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.


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.


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.


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.


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:

Reference Books:


**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:

Reference Book:
**Introduction:** The Three Kind 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.


**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:**

**Reference Book:**
**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.


**Text Book:**

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


Text Book:

Reference Books:


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


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:

Reference books:


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 Reliability and Quality Assurance: Reliability Metric- Musa’s Basic Model.

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


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:

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.


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


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

Text Book:

Reference Books:


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 (Cohan-Sutherland Line Clipping and Liang-Barkey 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.


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


Text Books:

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

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

**Government Correspondence:** Nothing, 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 Book:**

**Reference Book:**
1. Human Behavior at Work; John W Newstorm & Keith Davis; Tata McGraw Hill
2. The Most Common Mistakes in English Usage: Thomas Elliot Berry, Tata McGraw Hill
**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


**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

**Reference Book:**
1. Java Server Side Programming -WROX Publication
**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.


**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.


**Text Books**:  

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


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


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

Text Book:

Reference Book:
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 Relations:** Fuzzy Relations, Operations on Fuzzy Relations, α-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>=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:

Reference Books:


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

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.


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, Hierarchal addressing sub netting, ARP, PPP), Bridges, Routers.

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


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

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

Reference Books:

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.


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.


Text Book:

**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.


**Text Book:**

**Reference Book:**
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:
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.


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


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


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

Reference Books: