

Ewing Christian College

(An Autonomous Constituent College of Allahabad University)

Centre for Computer Sciences

B. Sc. – Computer Application

Approved Syllabus

(Implemented from session 2020 – 21)

Semester – I		
Paper Code	Paper Title	Marks
CAB101	Introduction to Computing Systems	75
CAB102	Programming in 'C'	75
CAB103	Lab-1	50
	Total	200
Semester – II		
CAB201	Computer Architecture and Organization	75
CAB202	Data Structures	75
CAB203	Lab-2	50
	Total	200
Semester – III		
CAB301	OOP with C++	75
CAB302	Operating System Concepts	75
CAB303	Lab-3	50
	Total	200
Semester – IV		
CAB401	Data Science	75
CAB402	Database Management Systems	75
CAB403	Lab.-4	50
	Total	200
Semester – V		
CAB501	System Analysis & Design	75
CAB502	Computer Graphics	75
CAB503	Java Programming	75
CAB504	Lab-5	75
	Total	300
Semester – VI		
CAB601	Web Technology	75
CAB602	.NET with C#	75
CAB603	Data Communication & Networks	75
CAB604	Project	75
	Total	300
	Grand Total	1400

Semester – I / Paper-I

CAB101-Introduction to Computing Systems

1. **An Introduction to Computers** – Computing History, Characteristics and Capabilities, Hardware and software, Generations of computers, Computer language generations - Machine level, Assembly & High level Computer languages, Translators - Compiler/Assembler and Interpreter, Computer classification, Computer Application Areas, Computer-ware, **Block Diagram** - CPU, Control Unit, ALU, **Input / Output Devices:** Keyboard, Mouse, VDU, LCD, LED, Printers, **Types of printers:** Dot Matrix, Laser and Inkjet., character set - ASCII, BCD and EBCDIC.
2. **Computer Memory** – Primary and Secondary memory. Types of Read Only Memory and Read-Write memory. SRAM, DRAM, PROM, EPROM, EEPROM, Flash Memory etc. Concept of cache memory, Memory hierarchy, Virtual memory.
3. **Storage Devices:** Storage mechanism in Magnetic and optical disks, concepts of tracks and sectors in magnetic and optical disks. Compact disc, DVD and Blue ray technology.
4. **Introduction to OS** – Operating system, Functions, Overview of MS-Windows, MS-DOS & Linux, Internal and External DOS Commands, Basic Linux Commands, **Advance computing concepts:** Grid Computing, Cloud Computing and Artificial Intelligence etc.

Suggested Readings:

1. Fundamental of Computers by Rajaraman
2. Computer Fundamentals by P K Sinha
3. Computer Fundamentals by B Ram
4. Learn DOS in a Day by Russell A. Stultz
5. UNIX Concepts & Applications by Sumitabaha Das

Semester – I / Paper-II
CAB102- Programming in ‘C’

1. **Introductory Concepts of Programming** - Introduction, History, Program Development Stages – Analysis, Design, Coding, Testing, Debugging and Implementation, Design Tools – Algorithm, flowchart, Program Constructs – Sequence, Selection, Iteration, algorithms/ flowcharts for GCD, factorial, Fibonacci series, prime numbers generation and other simple problems, searching and sorting techniques
2. **‘C’ Fundamentals**- Introduction to ‘C’, History & Development, Character Set, Identifiers and keywords, Tokens, Data Types, constants, variables, operators, Separators, Declarations, expressions, statements, Symbolic constants, **Control Statements**- if, switch, break, continue, for, while, do while.
3. **Functions**: Definition, Declaring a function, making function call, passing arguments to a function, recursion, functions with default arguments, standard library functions - mathematical, string, **Arrays**: Declaration, Initialization, processing an array- traversal, searching, sorting, merging, insertion, deletion, passing arrays to functions, Multidimensional arrays, Arrays and strings, **Structures**: definition, declaring a structure, accessing structure elements, memory allocation, array of structures, nested structures.
4. **Pointers**- Pointer declarations, pointer arithmetic, Passing pointers to the functions, pointers and one dimensional array, Operations on pointers, arrays of pointers, dynamic memory allocation, related functions, **Preprocessor Declaratives**- file inclusion, macro definition, conditional, **Data Files**- Opening and closing a text/ data file, file access modes, creating and reading a data file, working with binary data files.

Suggested Readings:

1. Let Us ‘C’ by Yashwant Kanetkar
2. ‘C’ in Depth by Yashwant Kanetkar
3. Programming in ANSI C by Balagursamy
4. Programming in ‘C’ by Kanthane

CAB201- Computer Architecture and Organization

1. **Data Representation:** Signed numbers, Fixed and Floating point numbers. Normalized floating point numbers. Computer arithmetic: Complements, Radix and diminished radix arithmetic. **Basic Computer Organization:** Central Processing Unit, Registers, ALU, System bus-their functions and interconnection. Memory Organization and interleaving, Cache and its mapping, Memory hierarchy.
2. **Microprocessor:** 8085 microprocessor, architecture, pin diagrams, interrupts, instructions, addressing modes, machine language, assembly language, simple programs. Comparative study of CISC Intel 8-bit microprocessors and 16 bit microprocessors. Characteristics of RISC and comparison with CISC.
3. **I/O Organization:** Memory mapped and standard I/O mapped. Modes of data transfer, Programmed I/O, interrupt driven, Direct Memory Access, DMA controller. Polling, Priority interrupt Controller.
4. **Parallel Organization:** Methods for parallelism in uniprocessor system, Flynn's and Feng's classifications, Instruction level pipelining and Superscalar Processors, Array processors, Multiple Processor Organizations, Amdahl's law, performance of parallel computers. Vector Computations.

Suggested Readings:

1. W. Stallings, "Computer Organization and Architecture: Designing for performance", Prentice Hall of India.
2. M. Mano, "Computer System Architecture", 3rd Edition, Pearson Education, Inc., 2003.
3. R.S. Gaonkar, "Microprocessor Architecture, Programming and Application with the 8085", 5th Edition, Penram International Publishing (India) Pvt. Ltd., 2011.
4. Rafiquzzaman, "Microprocessor, Theory and Application: Intel and Motorla, Prentice Hall of India.. 5. J. Hays, "Computer Architecture and Organization", McGraw-Hill.

Semester – II / Paper-II
CAB202- Data Structures

1. **Introduction:** Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off. **Stacks:** Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

2. **Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue. **Linked list:** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

3. **Trees:** Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary trees, Huffman algorithm. **Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees. Hashing Comparisons.

4. **Searching and Hashing:** Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. **Sorting:** Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort.

References

1. Y. Langsam, M. Augenstein and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia, 2nd Edition, 2002.
2. Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures in C++, Galgotia Book Source, New Delhi.
3. S. Lipschutz, Data Structures Mc-Graw Hill International Editions, 1986.
4. Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata Mc-Graw Hill International Editions, 2nd edition 1984.

Semester – III / Paper-I

CAB301- OOP with C++

- 1. Introduction:** Introduction to Programming Techniques – POP, OOP, OOP Concept, characteristics, Applications, Introduction to OOP languages, Introduction to C++, Features, Bridging C & C++ (Overview of C Concepts), C++ Data Types, Tokens, Keywords, Operators, **Decision Making & Branching:** If Statement, If-Else statement, Nesting of If-Else, Switch statement, **Looping:** While Statement, Do Statement, For Statement, Overview of functions & structures in C.
- 2. Class & Objects:** Declaring Data Members, Member Functions, Types of class Members, Array within a class. **Class Function Definition:** Member Function definition inside the class and outside the class, Friend Function, Inline Function, Static Members & Functions, Scope Resolution Operator, Private and Public Member Functions, Nesting of Member Functions. Creating Objects, Accessing class data members, Accessing member functions, Arrays of Objects, Objects as function arguments: Pass by value, Pass by reference, Pointers to Objects.
- 3. Constructors and Destructors:** Declaration and Definition, Default Constructors, Parameterized Constructors, Constructor Overloading, Copy Constructors. Destructors: Definition and use. **Inheritance** - Extending Classes Concept of inheritance, Base class, Derived class, Defining derived classes, Visibility modes: Private, public, protected; Types of Inheritance- Single, Multiple, Multilevel, Hybrid, Hierarchical, Nesting of classes.
- 4. Function Overloading & Operator Overloading:** Binary & Unary Operators. **Polymorphism:** Definition, early Binding, Polymorphism with pointers, Virtual Functions, late binding, pure virtual functions. **Input/output files:** Streams, buffers & iostreams, header files, redirection, file input and output.

Suggested Readings / Books:

1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, Tata Mc-Graw Hill
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition Galgotia Publications.
3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.
4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing

CAB302- Operating System Concepts

1. **Introduction:** Operating system and functions, Classification of Operating systems – Batch, interactive, Time sharing, Real time System, Multiprocess systems, Multithreaded Systems, Operating Systems Structure-Layered structure, System Components, Operating System service, Reentrant Kernels, Monolithic and Microkernel Systems.
2. **Concurrent Processes:** Process concept, Principle of concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker’s solution, Peterson’s solution, Semaphores, Test and Set operation, Classical Problem in concurrency- Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models and Schemes, Process Generation.
3. **CPU Scheduling:** Scheduling Concepts, Performance Criteria, Process States, Process Transition diagram Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model Deadlock Characterization, Prevention, Avoidance and detection, Recovery from deadlock.
4. **Memory Management:** Basic bare machine. Resident monitor , Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, thrashing, Cache memory organization, Locality of reference, I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, file organization and access mechanism, file directors, and File sharing, File system implementation issues, File system protection and security.

Suggested Readings:

1. Silberchatz, Galvin and Gagne, “Operating Systems Concept”, Wiley.
2. Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education.
3. Harvey M.Dietel, “An Introduction to Operating System”, Pearson Education.
4. D.M Dhamdhare, “Operating Systems: A Concept based Approach”, Tata McGraw-Hill Education.
5. Douglas Comer, “Operating System Design- the XINU Approach” Prentice Hall.

Semester – IV / Paper-I
CAB401- Data Science

1. Introduction: What is Data Science, Big Data and Data Science hype, getting past the hype - Why now? – Datafication - Current landscape of perspectives,

2. Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means, Artificial Neural Network (ANN) and Genetic Algorithms

3. Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests, **Mining Social-Network Graphs** - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs,

4. Data Visualization - Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset, **Data Science and Ethical Issues** - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

Suggested Readings:

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
3. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
4. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
5. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
6. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.

CAB402- DATABASE MANAGEMENT SYSTEMS

1. **Database Systems**, View of Data Models, Database Languages, DBMS Architecture, Database Users and Data Independence. ER Modeling, relation types, role and Structural Constraints, Extended ER Modeling Features, Design of an ER Database Schema, Reduction of ER Schema to Tables. Relational Model: Relational Model Concepts, Relational Algebra.
2. **Introduction to SQL & PL/SQL**: SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Queries and sub queries, Aggregate functions, Cursors in SQL. **PL/SQL**: PL/SQL data types, character set, variables, literals, constants, commit, rollback, locking, exceptions, triggers.
3. **Relational Database Design**: Functional and multi-valued Dependencies, Desirable Properties of Decomposition, Normalization up to BCNF. Concept and Design of Object Oriented Database. **Selected Database Issues**: Security, Transaction Management, Basic Algorithms to Query Processing and Query Optimization, Concurrency Control, Recovery Techniques, locking.
4. **Introduction to advance Database Concepts**: Data warehousing, Data mining, Big data, **Case Studies**: Oracle/ MS-SQL/ PL/SQL.

Suggested Readings:

1. C.J.Date, An Introduction to Database Systems, Vol I & II, Addison Wesley.
2. Korth Silberschatz, Data Base System Concepts, 4th ed., McGraw Hill.
3. J.D.Ullman, Principles of Database Systems, Golgotha, New Delhi.
4. Wiederhold, Database Design, McGraw Hill.
5. R. Elmasri, and S.B. Navathe, Fundamentals of Database Systems, Pearson Education Asia.
6. Raghu Ramakrishnan, Database Management Systems, McGraw-Hill Education.

CAB501- SYSTEM ANALYSIS AND DESIGN

1. **Concept of System and Information System:** Definition, **Types of Information System:** TPS, MIS, DSS, Interpersonal Communication System. **System Development Life Cycle:** Recognition of needs for System Change, Analysis, Design, Implementation & maintenance. **Feasibility Study:** Types of Feasibility, Steps. **Role of System Analyst:** Academic & Personal Qualifications, the Multifaceted Role of Analyst, the Analyst-User Interface.
2. **System Planning and Initial Investigation:** Strategies for Determining Information Requirement, Problem Definition & Project Initiation, Back Ground Analysis, Fact Analysis, Review of written Documents, On-site Observations, Interviews & Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis. **Information Gathering:** Information about the firms, Tools – Interview, Questionnaires.
3. **The Tools of Structured Analysis:** The Dataflow Diagram (DFD), Data Dictionary, Decision Tree and Structured English. Fundamental Design Activities- Verification and Validation, Input/output & Form Design: Input / CRT/ design, output design, Requirements, **System Testing:** Types of Testing, Preparing a Test Plan
4. **Quality Assurance:** Implementation of Quality assurance, Inspection, walks through, follow up, documentation and report writing. **Project Management:** Measuring the process, planning, estimating, identifying and evaluating risk, organizing resources, defining a project schedule, monitoring, review.

Suggested Readings:

1. Elias M. Awad, "System Analysis & Design", Galgotia Publication.
2. Hoffer, "Modern System Analysis & Design", Addison Wesley.
3. Kendall, "Introduction to System Analysis & Design", McGraw Hill.

CAB502- Computer Graphics

- 1. Basic Concepts:** Origin of Computer Graphics, new display devices, how the interactive graphics display works, general purpose graphics S/W, user interface. **Graphical Input Devices & Input Techniques:** Pointing and positioning devices, mouse, tablets, light-pen, 3 dimensional input devices, comparators, positioning techniques, pointing & selection, inking and painting.
- 2. Point Plotting Techniques:** Coordinate System, Incremental Method, Line Drawing Algorithms, Circle Generators, Line Drawing Displays – Display Devices & Controllers, The CRT, Inherent Memory Devices, The Storage Tube Display, The Refresh Line Drawing Display.
- 3. Two Dimensional Transformations:** Transformation Principles, Concatenation, Matrix Representation. **Clipping & Windowing:** Line Clipping Algo, Midpoint Subdivision, Polygon Clipping, Viewing Transformations, Windowing Transformations, segments, functions for segmenting, posting and unposting a segment, free storage allocation, display file.
- 4. Geometric Models:** Geometric Modeling, symbols and instances, boxing, advantages and limitations of display procedures. **Event Handling & Input Functions:** Polling, Interrupts, Event Queue, Event Handling Function, Dragging & Fixing, Hit Detection, Basic & Raster Graphics. **Transformations & Shading Models:** 3-D Transformations, parallel and perspective projections, simple shading models, Introduction to image editing and video editing software.

Suggested Readings:

1. Graphics Under C by Yashwant Kanetakar
2. Computer Graphics by Baker and Hearn
3. Computer Graphics : Schaum Series

Semester – V / Paper-III
CAB503- Java Programming

1. **Introduction to Java:** Features of Java, JDK Environment, Object Oriented Programming Concept Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA
2. **Java Programming Fundamental :**Structure of java program, Data types, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch),Looping(for, while) ,Type Casting, Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes, **Arrays and Strings:** Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods.
3. **Abstract Class, Interface and Packages:** Modifiers and Access Control, Abstract classes and methods, Interfaces, Packages Concept, Creating user defined packages, **Exception Handling:** Exception types, Using try catch and multiple catch, Nested try, throw, throws and finally, Creating User defined Exceptions.
4. **File Handling:** Byte Stream, Character Stream, File IO Basics, File Operations, Creating file, Reading file, Writing File, **Multithreaded Programming:** Creating Threads, extending the thread class, blocking and stopping a thread, **Applet Programming:** Introduction, Types Applet, Applet Life cycle, Creating Applet, Applet tag

Suggested Readings:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. E Balagurusamy , Programming with JAVA, TMH, 2007

CAB601- WEB TECHNOLOGY

1. **Introduction:** History of Web, Growth Of the Web, Protocols governing the web, Introduction To Cyber Laws in India, Introduction to International Cyber Laws, Web Browser, Web Server, Web Development Tools.
2. **HTML:** Introduction, HTML Tags, Links, List, Tables, Frames, Forms, Checkboxes, Text fields and Text areas, Comments in HTML, Style Sheets
3. **JAVA SCRIPT:** Introduction, Documents, Forms, Statements, functions, objects, Events and Event Handling, Arrays, Working with browser objects, Creating browser-specific scripts & Cross-browser scripts, **PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC
4. **ASP:** Introduction, Objects, Methods, Establishing Database Connections, **Web Publishing:** Setting/ Hosting Website

Suggested Readings:

1. HTML 4.0 – E Stephen Mack & Janan Platt
2. The ABCs of JavaScript – Lee Purcell, Mary Jane Mava
3. Active Server Pages 2.0 – Stephen Walther
4. Active Server Pages 3 – A Russel Jones
5. Commercial Web Development Using HTML, DHTML, Java Script, CGI, Perl- Ivan Bayross.

CAB602- .NET WITH C#

- 1. Introduction to .NET:** Definition, Features of .NET, CLR, CTS, CLS, MSIL, Managed Code and Managed data, Assembly, Namespace, Introduction to C#, Features of C#, **Types and Variables:** value type, reference type, Boxing and Un Boxing, Instance variable, array elements, Parameters(value/ reference/ output), local variables.
- 2. Control Statements:** if, switch, while, do, for, for-each, break, continue, goto, return statements. **Exception Handling:** Exception, causes of exception, checked and un checked statements, compiler setting and overflow checking, try/catch, try/finally, try/catch/finally, throwing exceptions. **Namespace:** Definition, Namespace declaration, using directives, alias.
- 3. Classes:** Definition and declaration, class modifiers, Abstract class, sealed class, Constructors and Destructors, Methods, Methods Parameters (value/ reference/ output), parameter array, static and instance method, virtual method, override method, method overloading, method hiding, sealed method, Abstract method, **Properties, Array Indexes:** Definition, Accessors, Read-only and write-only properties, Definition and declaration of arrays, single dimension/ multi dimension array, rank of an array, jagged array, Indexes.
- 4. Structure, Enums, Delegates and Events:** Definition of struct, difference between class and struct, Enums, Enum members, Definition of delegates, single cast and multi cast delegates, Events. **Inheritance and Interface:** Definition of Inheritance and Interface, working with interface, inheritance of interfaces, Interface implementation, multiple implementations. **ADO.NET:** Introduction, Difference between ADO and ADO.NET, primary objects of ADO.NET, Reading/ Writing/ Updating/ displaying data in a data grid.

Suggested Readings:

1. Programming in C# by E Balagurusamy
2. C#: Nuts & Bolts by Sonal Mukhi
3. C#: A Complete Reference by Herbert Schildt

CAB603- DATA COMMUNICATION & NETWORKS

1. **Introduction:** History & development of computer network, network topologies, **Transmission media-** UTP, STP, Coaxial Cable, Optical Fiber, analog & digital transmission, multiplexing, FDM, TDM, Classification of Network in various ways.
2. **Data Transmission Basics:** Synchronous/Asynchronous, Error detection and correction methods, Data Compression, Protocol basic, circuit, message, packet and cell switching, connection oriented and connectionless network, ISO-OSI model, TCP/IP model, Ethernet, CSMA/CD, CSMA/CA, Token passing ring, FDDI.
3. **Networking Devices:** Hubs, Repeaters, Internetworking: Routers, Bridges, Switches, Gateways, Routing Basics, Routing algorithms, Implementation of wired and wireless networks, IP addressing, Sub netting, CIDR, Designing a campus-wide network.
4. **Internet:** Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, network applications: Client Server Concepts.

Suggested Readings:

1. A. S. Tennanbaum, –Computer Network,|| 2nd Edition, PHI
2. Data Communication and Computer Networking – Behrouz A. Forouzan.
3. Data and Computer communication- W. Stalling.
 4. A top-down approach to computer Networking – Kurose, Ross.