

This course is an attempt to upgrade and enhance your theoretical skills and provide the hands on experience. By the end of these practical sessions of this course, you will be able to write programs using basic data structures such as Arrays etc. as well as advanced data structures such as trees etc.

Syllabus

SECTION 1: Data and File Structures Lab Manual

- Arrays
- Structures
- Linked Lists
- Stacks
- Queues
- Trees
- Advanced Trees
- Graphs
- Searching
- Sorting

7. BCSL-034: DBMS Lab

1 Credit

Objectives: This lab is based on the courses MCS-023,. This lab course involves the development of the practical skills in DBMS using MS-Access , Theoretical aspects were already covered in the respective theory courses. This course is an attempt to upgrade and enhance your theoretical skills and provide the hands on experience. By the end of these practical sessions of this course, you will be able to create databases and use DBMS Tools in the areas of Database applications.

Syllabus

SECTION 1: DBMS Lab

- Introduction to MS-Access
- Database Creation
- Use of DBMS Tools/Client-Server Mode
- Forms and Procedures

4.4 Detailed Syllabus of BCA Forth Semester

1. BCS-040: Statistical Techniques

4 Credits

BLOCK 1: Statistics and Probability

Unit 1: Descriptive Statistics

Collecting Data, Kinds of Data, Frequency Distribution of a Variable, Graphical Representation of Frequency Distribution, Summarisation of Data, Measures of Central Tendency, Measures of Dispersion or Variability.

Unit 2: Probability Concepts

Preliminaries, Trials, Sample Space, Events, Algebra of Events, Probability Concepts, Probability of an Event, Probability of Compound Events, Conditional Probability and Independent Events.

Unit 3: Probability Distributions

Random Variable, Discrete Random Variable, Continuous Random Variable, Binomial Distribution, Poisson Distribution, Uniform Distribution, Normal Distribution.

BLOCK 2: Statistical Inference

Unit 4: Sampling Distributions

Population and Samples, What is a Sampling Distribution, t-distribution, Chi-Square distribution F-distribution.

Unit 5: Estimation

Point Estimation, Criteria For a Good Estimator, Interval Estimation, Confidence Interval for Mean with Known Variance, Confidence Interval for Mean with Known Variance, Confidence Interval for Proportion.

Unit 6: Tests of Significance

Some Basic Concepts, Tests About the Mean, Difference in the Means of Two Populations Test About the Variance.

Unit 7: Applications of Chi-Square in Problems with Categorical Data

Goodness-of-fit, Test of Independence.

BLOCK 3: Applies Statistical Methods

Unit 8: Analysis of Variance: One-Way Classification

Analysis of Variance: Basic Concepts, Source of Variance, One-Way Classification Model for One-Way Classification, Test Procedure, Sums of Squares, Preparation of ANOVA Table, Pairwise Comparisons, Unbalanced Data, Random Effects Model.

Unit 9: Regression Analysis

Simple Linear Regression, Measures of Goodness of Fit, Multiple Linear Regression, Preliminaries, Regression with Two Independent Variables.

Unit 10: Forecasting and Time Series Analysis

Forecasting, Time Series and Their Components, Long-term Trend, Seasonal Variations, Cyclic Variations, Random Variations/Irregular Fluctuations, Forecasting Models, the Additive Model, the Multiplicative Model, Forecasting Long-term Trends, The Methods of Least Squares, the Methods of Moving Averages, Exponential Smoothing.

Unit 11: Statistical Quality Control

Concept of Quality, Nature of Quality Control, Statistical Process Control, Concepts of Variation, Control Charts, Control Charts For Variables, Process Capability Analysis, Control Charts For Attributes, Acceptance Sampling, Sampling Plan Concepts, Single Sampling Plans.

BLOCK 4: Sampling

Unit 12: Simple Random Sampling and Systematic Sampling

Sampling- What and Why? Preliminaries, Simple Random Sampling, Estimation of Population Parameters Systematic Sampling, Linear Systematic Sampling, Circular Systematic Sampling, Advantages and, Limitations of Systematic Sampling.

Unit 13: Stratified Sampling

Stratified Sampling, Preliminaries, Advantages, Estimation of population parameters, Allocation of sample size, Construction of strata, Post-Stratification.

Unit 14: Cluster Sampling and Multistage Sampling

Cluster Sampling, Preliminaries, Estimation of population mean, Efficiency of cluster sampling Multistage sampling, Preliminaries, Estimation of mean in two stage sampling.

Note: There may be some minor changes in the syllabus of BCS-040.

2. MCS-024: Object Oriented Technologies and Java Programming 3 Credits

Objectives:

Today almost every branch of computer science is feeling presence of object- orientation. Object oriented technology is successfully incorporated in various fields of computer science. Since its arrival on the scene in 1995, the Java has been accepted as one of the primary programming language.

This course is designed to give you exposure to basic concepts of object-oriented technology. This course will help in learning to write programs in Java using object-oriented paradigm. Approach in this course is to take Java as a language that is used as a primary tool in many different areas of programming work.

Syllabus

BLOCK 1: Object Oriented Technology and Java

Unit 1: Object Oriented Methodology-1

Paradigms of Programming Languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure Oriented Approaches, Benefits of OOPs, Introduction to Common OO Language, Applications of OOPs.

Unit 2: Object Oriented Methodology-2

Classes and Objects, Abstraction and Encapsulation, Inheritance, Method Overriding and Polymorphism.

Unit 3: Java Language Basics

Introduction To Java, Basic Features, Java Virtual Machine Concepts, A Simple Java Program, Primitive Data Type And Variables, Java Keywords, Integer and Floating Point Data Type, Character and Boolean Types, Declaring and Initialization Variables, Java Operators.

Unit 4: Expressions, Statements and Arrays

Expressions, Statements, Control Statements, Selection Statements, Iterative Statements, Jump Statements, Arrays.

BLOCK 2: Object Oriented Concepts and Exceptions Handling

Unit 1: Class and Objects

Class Fundamentals, Creating objects, Assigning object reference variables, Introducing Methods, Static methods, Constructors, Overloading constructors, This Keyword, Using Objects as Parameters, Argument passing, Returning objects, Method Overloading, Garbage Collection, The Finalize () Method.

Unit 2: Inheritance and Polymorphism

Inheritance Basics, Access Control, Multilevel Inheritance, Method Overriding, Abstract Classes, Polymorphism, Final Keyword.

Unit 3: Packages and Interfaces

Package, Defining Package, CLASSPATH, Package naming, Accessibility of Packages, Using Package Members, Interfaces, Implementing Interfaces, Interface and Abstract Classes, Extends and Implements Together.

Unit 4: Exceptions Handling

Exception, Handling of Exception, Using try-catch, Catching Multiple Exceptions, Using finally clause, Types of Exceptions, Throwing Exceptions, Writing Exception Subclasses.

BLOCK 3: Multithreading, I/O and String Handling

Unit 1: Multithreaded Programming

Multithreading: An Introduction, The Main Thread, Java Thread Model, Thread Priorities, Synchronization in Java, Interthread Communication.

Unit 2: I/O in Java

I/O Basics, Streams and Stream Classes, Byte Stream Classes, Character Stream Classes, The Predefined Streams, Reading from, and Writing to, Console, Reading and Writing Files, The Transient and Volatile Modifiers, Using Instance of Native Methods.

Unit 3: Strings and Characters

Fundamentals of Characters and Strings, The String Class, String Operations, Data Conversion using Value Of () Methods, String Buffer Class and Methods.

Unit 4: Exploring Java I/O

Java I/O Classes and Interfaces, I/O Stream Classes, Input and Output Stream, Input Stream and Output Stream Hierarchy, Text Streams, Stream Tokenizer, Serialization, Buffered Stream, Print Stream, Random Access File.

BLOCK 4: Applets Programming and Advance Java Concepts

Unit 1: Applets

The Applet Class, Applet Architecture, An Applet Skeleton: Initialization and Termination, Handling Events, HTML Applet Tag.

Unit 2: Graphics and User Interfaces

Graphics Contexts and Graphics Objects, Color Control, Fonts, Coordinate System, User Interface Components, Building User Interface with AWT, Swing-based GUI, Layouts and Layout Manager, Container.

Unit 3: Networking Features

Socket Overview, Reserved Ports and Proxy Servers, Internet Addressing: Domain Naming Services (DNS), JAVA and the net: URL, TCP/IP Sockets, Datagrams.

Unit 4: Advance Java

Java Database Connectivity, Establishing A Connection, Transactions with Database, An Overview of RMI Applications, Remote Classes and Interfaces, RMI Architecture, RMI Object Hierarchy, Security, Java Servlets, Servlet Life Cycle, Get and Post Methods, Session Handling, Java Beans.

3. BCS-041: Fundamental of Computer Networks

4 Credits

Objectives:

This course introduces the basics of data communication and networking. Students will develop an understanding of the general principles of data communication and networking as used in networks. It also includes an activity of setting up a small local area network. The goal of this course is that the student will develop an understanding of the structure of network, its elements and how these elements operate and communicate with each other.

BLOCK 1: Concepts of Communication and Networking

Unit 1: Basics of Data Communication

Concept of communication system, Analog and Digital Communication, Data communication modes, Synchronous and asynchronous transmission, Simplex, half-duplex, full duplex communication, Networking Protocols and Standards, Layering, OSI reference model, encapsulation, End-to-end argument. Protocol design issues, Applications.

Unit 2: Modulation and Encoding

Analog Modulation (AM, FM, PM), AM Demodulation (one technique only), Advantages and Disadvantages of each., Analog to Digital (Digitization), Sampling, Quantization, Digital to Analog, Digital Modulation (ASK, FSK, PSK, QPSK).

Unit 3: Multiplexing and Switching

Concept, FDM, TDM, SDM, Multiplexing Applications, Circuit and Packet Switching.

Unit 4: Communication Mediums

Digital data transmission, Serial and Parallel Transmission, Guided and Unguided mediums, Wireless Communication, Coaxial Cables, Twisted Pair Cables, Fiber Optic Cables, Connectors.

BLOCK 2: Networks and Devices

Unit 1: Network Classifications and Topologies

Network Concept, LAN overview, LAN Topologies, LAN access methods, Network Types based on size like PAN, LAN, MAN, WAN, Functional Classification of Networks, Peer to Peer, Client Server. Wide Area Network, WAN Topologies, WAN Access Methods.

Unit 2: OSI and TCP/IP Models

Introduction of OSI Model, Need of such Models, Basic functions of each OSI layer, Introduction to TCP/IP, Comparisons with TCP/IP layers. (At the beginner's level).

Unit 3: Physical and Data link Layer

Error detection and correction, CRC, Framing, Retransmission strategies, Multi-access communication, CSMA/CD, Ethernet, Addressing, ARP and RARP.

Unit 4: Internetworking Devices

Network Interface Cards, Modems, Repeaters, Hubs, Bridges, Switch (L2 and L3 differences) and gateways.

BLOCK 3: Network, Transport and Application Layer

Unit 1: Network layer

Circuit and packet switching, Routing, Congestion control, Routing protocols: distance vector vs link-state routing, DV problems, Network Addressing, Forwarding, Fragmentation, Error Messaging Services.

Unit 2: Transport layer

Addressing and multiplexing, Flow control, congestion control, data transport, Port numbers, service models, Intro to reliability, QoS.

Unit 3: Application Layer

DNS, Remote Logging, File transfer, Network Management, client-server applications, WWW, E-mail, MIME.

Unit 4: Network Applications

Internet Applications like emails, chatting, social networking, Rail Reservations, Information Sharing, e-governance, Online Processing and Collaborations, etc., Mobile Applications.

BLOCK 4: Network Design and Security

Unit 1: Building a Simple Network

Examples of designing the developing small networks, Structure Cabling, Integrating home computers and devices, creating a small Networking.

Unit 2: Introduction to Network Architectures

X.25, Frame relay, Telephone network, ATM network, ISP, IPv4 and IPv6 overview

Unit 3: Introduction to Wireless and Mobile Networks

Introduction to wireless communication systems, modern wireless communication systems and generations, Introduction to cellular mobile systems, CDMA, cellular system design fundamentals.

Unit 4: Network Security

Introduction to computer security, Security services, Authentication and Privacy, Block and Stream Ciphers, Public and Private key Cryptography, Introduction to RSA, MD5 and DES at the beginner's level.

4. BCS-042: Analysis and Design of Algorithms

2 Credits

Objectives:

To learn about properties of algorithm and how to design an algorithm, discuss asymptotic notations, Design and measure time complexity analysis of searching, sorting and Graph traversal algorithms. Make comparison of different type of algorithm likes Linear, Quadratic, Polynomial and Exponential, Describe how greedy approach facilitate solving the problem. Discuss Divide and Conquer approach for solving the problem.

BLOCK 1: Introduction to Algorithm

Unit 1: Basics of an Algorithm

Definition and Example of an algorithm, Characteristics of an algorithm, Steps in Designing of Algorithms, Growth of function, Recurrence, Problem Formulation (Tower of Hanoi), Substitution Method, Iteration Method, Master Method.

Unit 2: Asymptotic Bounds

Asymptotic Notations, Concept of efficiency of analysis of an algorithm Comparative efficiencies of algorithms: Linear, Quadratic, Polynomial and Exponential.

Unit 3: Analysis of simple Algorithms

Euclid's algorithm for GCD, Horner's Rule for polynomial evaluation, Simple Matrix ($n \times n$) Multiplication, Exponent evaluation e.g. a^n , Searching, Linear Search, Sorting, Bubble sort, Insertion Sort, Selection sort.

BLOCK 2: Design Techniques

Unit 1: Greedy Technique

Elements of Greedy strategy, Activity Selection Problem, Continuous Knapsack Problem, Coin changing Problem, More Examples.

Unit 2: Divide and Conquer Approach

General Issues in Divide and Conquer, Binary Search, Merge Sort, Quick Sort, Integer Multiplication, More Examples.

Unit 3: Graph Algorithm

Representation of Graphs, Adjacency Matrix, Adjacency List, Depth First Search and Examples, Breadth First Search and Examples.

5. MCSL-016: Internet Concepts and Web Design (Lab Course) 2 Credits

Objectives:

The main objective of the course is to introduce the whole range of web technologies starting from HTML, DHTML, Java Script, VBScript, and Dreamweaver. It also gives a brief description on Internet. Through the various examples the course will describe how to design specific page, dynamic web page, forms and frames. It also focuses on the practical aspects of these technologies.

Syllabus

BLOCK 1: Scripting Languages

Unit 1: The Internet

Classification of Networks, Networking Models, What is Packet Switching, Accessing the Internet, Internet Protocols, Internet Protocol (IP), Transmission Control Protocol (TCP), Internet Address, Structure of Internet Servers Address, Address Space, How does the Internet work, Intranet & Extranet, Internet Infrastructure, Protocols and Services on Internet, Domain Name System, SMTP and Electronic Mail, Http and World Wide Web, Usenet and Newgroups, FTP, Telnet, Internet Tools, Search Engines, Web Browser.

Unit 2: Introduction to HTML

What is HTML, Basic Tags of HTML, HTML Tag, TITLE Tag, BODY Tag, Formatting of Text, Headers, Formatting Tags, PRE Tag, FONT Tag, Special Characters, Working with Images, META Tag.

Unit 3: Advanced HTML

Links, Anchor tag, Lists, Unordered Lists, Ordered Lists, Definition Lists, Tables, TABLE, TR and TD Tags, Cell Spacing and Cell Padding, Colspan and Rowspan, Frames, Frameset, FRAME Tag, NOFRAMES Tag, Forms, FORM and INPUT Tag, Text Box, Radio Button, Checkbox, SELECT Tag and Pull Down Lists, Hidden, Submit and Reset, Some Special Tags, COLGROUP, THREAD, TBODY, TFOOT, _blank, _self, _parent, _top, IFRAME, LABEL, Attribute for <SELECT>, TEXTAREA.

Unit 4: Introduction to JavaScript

JavaScript Variables and Data Types, Declaring Variables, Data Types, Statements and Operators, Control Structures, Conditional Statements, Loop Statements, Object-Based Programming, Functions, Executing Deferred Scripts, Objects, Message box in JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Event Handlers, Forms, Forms Array.

Unit 5: VB Script

What is VBScript? Adding VBScript Code to an HTML Page, VB Script Basics, VBScript Data Types, VBScript Variables, VBScript Constants, VBScript Operators, Using Conditional Statements, Looping Through Code, VBScript Procedures, VBScript Coding Conventions, Dictionary Object in VBScript, Methods: VBScript Dictionary Object, VBScript Dictionary Object Properties, Err Object, Methods: VBScript Err Object, Properties: VBScript Err Object.

Unit 6: Dreamweaver

Using Dreamweaver, Create a Site Home Page, Design a Page in Layout View, Insert Images, Insert Text, Work in Standard View, View the Site Files, Link your Documents.

BLOCK 2: Lab Manual

Section 1: HTML (Hypertext Markup Language)

- Basic of HTML
- How to Create HTML Document
- Steps for Creating a Simple HTML Program

Section 2: Advanced HTML

- Advanced Topics of HTML

Section 3: JavaScript

- Script Basics
- Incorporating JavaScript into a Web Page

Section 4: VBScript

- VBScript Basics
- Incorporating VBScript into HTML Page

Section 5: Dreamweaver

- How to Work in Dreamweaver??
- How to save your file?
- Adding Layers to the Timeline and Giving Motion to the Layer
- Inserting Scripts
- Inserting External Media in the Web Page
- Adding SSI(Server-side include to the Page)
- Adding CSS Style to your Page
- Adding XML Files to your Page
- To Export a Dreamweaver Document as XML File, checking entries, working in frames, windows control, the Java script URL.

6. BCSL-043: Java Programming Lab

1 Credit

Objectives

This lab is based on the course MCS-024. This lab course involves the development of the practical skills in Java Programming. Theoretical aspects were already covered in the respective theory courses. This course is an attempt to upgrade and enhance your theoretical skills and provide the hands on experience in Java programming. By the end of these practical sessions of this course, you will be able to write programs using java programming language.

SECTION 1: Java Programming Lab

- Programming with Java
- PATH and CLASSPATH Setting
- Example Programs
- List of Lab Assignments

7. BCSL-044: Statistical Techniques Lab

1 Credit

This course is based on Statistical Techniques course.

Objectives:

This lab course will provide opportunity to the learners to implement the concepts and techniques learned in Statistical Techniques course in C/C++ Language and/or in MS-Excel.

Session wise coverage:

Session 1 : Frequency distribution, central tendency and dispersion.

Session 2,3, 4: Hypothesis testing, t distribution, chi square distribution of distribution, normal distribution.

Session 5 : Regression and correlation coefficient-univariate, multivariate.

Session 6 : Anova test.

Session 7 : Central charts.

Session 8 : Time series.

Session 9, 10 : Sampling for a problem domain and analyse – Case Study.

8. BCSL-045 : Analysis and Design of Algorithms Lab

1 Credit

This course will cover practical implementations of several algorithms covered in BCS-042 course.

4.5 Detailed Syllabus of BCA Fifth Semester

1. BCS-051: Introduction to Software Engineering

3 Credits

Objectives:

After studying the course, the student should:

- a) Be able to develop SRS as per any of the existing standards;
- b) Know various Function and Object oriented modeling & design techniques;
- c) Know various testing techniques;
- d) Know different Software Development Life Cycle models; and
- e) Know the concepts of Software Project Management.