4.1   DATA STRUCTURES USING 'C'

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RATIONALE

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of 'C' language and data structures will be reinforced by practical exercises during the course of study. The course will help students to develop the capability of selecting a particular data structure.

DETAILED CONTENTS

1.   Fundamental Notations   (4 hrs)

  1.1   Problem solving concept, top down and bottom up design, structured programming
  1.2   Concept of data types, variables and constants
  1.3   Concept of pointer variables and constants
  1.4   Introduction to data Structure(Linear, Non Linear, Primitive, Non Primitive)
  1.5   Concepts of Data Structure(Array, Linked List, Stack, Queue, Trees, graphs)

2.   Arrays   (8 hrs)

  2.1   Concept of Arrays
  2.2   Single dimensional array
  2.3   Two dimensional array: Representation of Two dimensional Array(Base Address, LB, UB)
  2.4   Operations on arrays with Algorithms (searching, traversing, inserting, deleting)

3.   Linked Lists   (8 hrs)

  3.1   Introduction to linked list and double linked list
  3.2   Representation of linked lists in Memory, Comparison between Linked List and Array
  3.3   Traversing a linked list
  3.4   Searching linked list
  3.5   Insertion and deletion into linked list (At first Node, Specified Position, Last node
  3.6   Application of linked lists
  3.7   Doubly linked lists
  3.8   Traversing a doubly linked lists
  3.9   Insertion and deletion into doubly linked lists

4.   Stacks, Queues and Recursion   (10 hrs)

    4.1   Introduction to stacks
    4.2   Representation of stacks with array and Linked List
    4.3   Implementation of stacks
    4.4   Application of stacks
        -      Polish Notations
        -      Converting Infix to Post Fix Notation
        -      Evaluation of Post Fix Notation
        -      Tower of Hanoi
    4.5   Recursion: Concept and Comparison between recursion and Iteration
    4.6   Introduction to queues
    4.7   Implementation of queues (array and Linked List with algorithm)
    4.8   Circular Queues
    4.9   De-queues

5.   Trees: Introduction   (10 hrs)

    5.1   Concept of Binary Trees (Complete, Extended Binary Tree)
    5.2   Concept of representation of Binary Tree
    5.3   Concept of balanced Binary Tree
    5.4   Traversing Binary Trees (Pre order, Post order and In order)
    5.5   Searching, inserting and deleting in binary search trees

6.   Sorting and Searching   (8 hrs)

    6.1   Introduction
    6.2   Search algorithm (Linear and Binary)
    6.3   Concept of sorting
    6.4   Sorting algorithms (Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Radix Sort, Heap Sort)

LIST OF PRACTICLES

Write Programmes in C to implement

1. The addition of two matrices using functions
2. Inserting and deleting elements in array
3. Push and pop operation in stack
4. Conversion from in-fix notation
5. The factorial of a given number using recursion
6. Insertion and Deletion of elements in queue using pointers
7. Insertion and Deletion of elements in circular queue using pointers
8. Insertion and Deletion of elements in linked list
9. Insertion and Deletion of elements in doubly linked list
10. The linear search procedures to search an element in given list
11. The binary search procedures to search an element in a given list
12. The bubble sort techniques
13. The selection sort techniques

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Allotted marks (%)	Allotted Time (in hrs)
1.	4	8
2.	8	16
3.	8	16
4.	10	22
5.	10	22
6.	8	16
Total	**48**	**100**

4.2 COMPUTER ORGANIZATION

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4 - -

RATIONALE

The subject provides the students with the knowledge of detailed organization of currently available personal computers in order to understand their functioning and maintenance. The students will also get familiar with Architecture of multi processor systems.

DETAILED CONTENTS

1. Hardware organisation of computer system   (20hrs)

    - CPU organisation : general register organisation, stack organisation, instruction formats(three address, two address, one address, zero address and RISC instruction).
      Addressing modes: Immediate, register, direct, in direct, relative, indexed.

    - CPU Design : Microprogrammed vs hard wired control.

    - Reduced instruction set computers: CISC characteristics, RISC characteristics, and their comparison.

2. Memory organisation   (18hrs)

    - Memory Hierarchy
    - RAM and ROM chips, Memory address map, Memory connections to CPU.
    - Auxillary memory : Magnetic disks and magnetic tapes.
    - Associative memory
    - Cache memory
    - Virtual memory
    - Memory management hardware

3. I/O organisation   (12hrs)

    a. Basis Input output system(BIOS)
        o Function of BIOS
        o Testing and initialization
        o Configuring the system
    b. Modes of Data Transfer
        o Programmed I/O : Synchronous, asynchronous and interrupt initiated.
        o DMA data transfer

4. Architecture of multi processor systems   (14hrs)

- Forms of parallel processing
- Parallel processing and pipelines, basic characteristics of multiprocessor
- General purpose multiprocessors'
- Interconnection networks : time shared common bus, multi port memory, cross bar switch, multi stage switching networks and hyper cube structures.

LIST OF RECOMENEDED BOOKS

1. Computer Architecture and Organisation by Moris Mano
2. Computer Architecture by J.P.Hayes
3. Structured Computer Organisation By Tanenbaum Andrew S, Phi

INSTRUCTIONAL STRATEGY

Since the subject is theoretical one, the practical aspects should be taught along with the theory instruction. The students be given quiz tests and asked to give seminars on small topics. There is sufficient time in the subject and the students can be taken to laboratory for demonstration.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (in hrs)	Marks Allotted (%)
1.	20	32
2.	18	28
3.	12	20
4.	14	20
Total	**64**	**100**

4.3   DATABASE MANAGEMENT SYSTEM

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3 - 3

RATIONALE

Database and database systems have become an essential component of everyday life in modern society. This course will acquaint the students with the knowledge of fundamental concepts of DBMS and its application in different areas, storage, manipulation and retrieval of data using query languages.

DETAILED CONTENTS

1. Introduction

(8 hrs)

1.1 Database Systems

1.1.1   Introduction to Database and its purpose
1.1.2   Introduction to Database system
1.1.3   Why Database
1.1.4   History of Database System
1.1.5   Characteristics of the database approach
1.1.6   Advantages and disadvantages of database systems
1.1.7   Introduction to Conventional File System
1.1.7   Concept of files ,record, data, information retrieval.
1.1.9   Comparison between Conventional System and DataBase System

1.2   Classification of DBMS Users

1.2.1   Actors on the scene
1.2.2   Database Administrators, Database Designers, End Users, System Analysts and Application Programmers
1.2.3   Workers behind the scene (DBMS system designers and implementers, tool developers, operator and maintenance personnel)
1.2.4   History of data base System

2.   Database System Concepts and Architecture   (12 hrs)

2.1   Data models: (Physical Model, Object based Model, Record based Model Network Model, Heirachical Model) schemas, sub schemas instances, data base state. Case Study of models and schemas (examples student information System)

2.2   DBMS Architecture: Three Level of Architecures

2.2.1   The External level
2.2.2   The conceptual level
2.2.3   The internal level
2.2.4   Mappings

2.3   Data base Administrator and Administration, Database Management System – Advantage and Disadvantage, Classification of DBMS, DBMS Interfaces

2.4   Concept of centralized and Client /Server Architecture for DBMS: Single Tier, Two Tier and Three Tier

2.5   Data Independence

         2.5.1   Logical data Independence
         2.5.2   Physical data Independence

2.6   Database Languages and Interfaces

         2.6.1   DBMS Language
         2.6.2   DBMS Interfaces

2.7   Classification of Database Management Systems:Centralized, Distributed, parallel and Object based

3.   Data Modeling using E.R. Model (Entity Relationship Model)   (12 hrs)

     3.1   Data Models Classification : File based or primitive models, traditional data models, semantic data models.
     3.2   Entities and Attributes
     3.3   Entity types and Entity sets
     3.4   Key attribute and domain of attributes
     3.5   Relationship among entities
     3.6   Database design with E/R model
     3.7   ER Design Issues
     3.8   Mapping Constraints

4.   Relational Model: (6 hrs)

     4.1   Relational Model Concepts: Domain, Attributes, Tuples, Cardinality Keys(Primary, Secondary, foreign, Alternative Keys etc)and Relations

5.   Structured Query Language   (10 hrs)
     Data definition language : Create, Alter, Drop commands]

     5.1   Data Manipulation Language (DML)
     5.2   Select command with where clause using conditional expressions and Boolean operators, group by clause, like operator.
     5.3   Insert, Update and Delete commands

LIST OF PRACTICALS

1. Overview, Features and functionality, Application development in MS-Access
2. Exercises on different forms of select statement, altering and droping of tables
3. Exercises on creation of tables
4. Exercises on insertion of data into tables
5. Exercises on deletion of data using different conditions
6. Exercises on UPDATE statement

INSTRUCTIONAL STRATEGY

Explanation of concepts using real time examples, diagrams etc. For practical sessions books along with CDs or learning materials with specified activities are required. Various exercises and small applications should be given along with theoretical explanation of concepts.

RECOMMENDED BOOKS

Database system concepts by Abraham
1)   Database system concepts by Abraham Silberschatz, Henry F.Kroth and S. Sudharshan; McGraw Hill Publishers, 5th Edition.
2)   Fundamentals of Database Systems by Elmasri/Navathe/Adison Wesley
3)   An introduction to database systems by Date C.J. Adison Wesley
4)   SQL Unleashed by Hans Ladanyi Techmedia Publications, New Delhi
5)   Database Management Systems by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., New Delhi
6)   Fundamentals of Database Management Systems by Dr Renu Vig and Ekta Walia, - an ISTE, Publication, New Delhi
7)   Oracle 8, The complete reference by Koch and Loney, Tata McGraw Hill Publications New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Allotted time (in hrs)	Allotted Marks (in %)
1	8	16
2	12	26
3	12	26
4	6	12
5	10	20
Total	**48**	**100**

4.4   OBJECT ORIENTED PROGRAMMING USING C++

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RATIONALE

Object orientation is a new approach to understand the complexities of the real world.   In contrast to the earlier approaches like procedural etc, object orientation helps to formulate the problems in a better way giving high reliability, adaptability and extensibility to the applications. The students are already familiar with this concept of programming in C which is the basic for C++. This course offers the modern programming language C++ that shall help the students to implement the various concept of object orientation practically. The students will be able to programme in the object oriented technology with the usage of C++.

DETAILED CONTENTS

1.   Introduction and Features   (5 hrs)

    1.1   Fundamentals of object oriented programming – procedure oriented programming Vs. object oriented programming (OOP)

    1.2   Object oriented programming concepts – Classes, reusability, encapsulation, inheritance, polymorphism, dynamic binding, message passing, Data Hiding

    1.3   Benefits of OOPs and its Application

2.   Language Constructs   (13 hrs)

Review of constructs of C used in C++: variables, types and type declarations, user defined data types; increment and decrement operators, relational and logical operators; if then else clause; conditional expressions, input and output statement, loops, switch case, arrays, structure, unions, functions, pointers; preprocessor directives and Header Files, Scope Resolution Operator Managing Console I/O Operations; C++ Stream, Unformatted and Formatted Console I/O

3.   Classes and Objects   (6 Hrs)

    3.1   Creation, accessing class members
    3.2   Private Vs Public
    3.3   Constructor and Destructor with and without Arguments
    3.4   Objects
    3.5   Dynamic memory Allocation with new and Delete Operator

4.   Member Functions   (4 Hrs)

    4.1   Method definition

    4.2   Inline Implementation

    4.3   Constant member functions

    4.4   Static Function, This Pointer

    4.5   Friend Function and its Characteristics

5.   Overloading Member Functions   (4 hrs)

Introduction to Operator Overloading, Need of operator overloading, prefix and postfix, overloading binary operators instream/outstream operator overloading, Constructor Overloading, Type Conversion, Rules of Operator Overloading.Comparison between Function Overloading and overriding

6.   Inheritance   (6 hrs)

Definition of inheritance, Types of inheritance; Single inheritance,   hierarchical inheritance, multiple inheritance, hybrid inheritance ,protected data, private data, public/data, inheriting constructors and destructors, constructor for virtual base classes, constructors and destructors of derived classes, and virtual functions, size of a derived class, order of invocation,

7.   Polymorphism and Virtual Functions   (5 hrs)

Importance of virtual function, function call binding, virtual functions, implementing late binding, need for virtual functions, abstract base classes and pure virtual functions, virtual destructors

8.   File and Streams   (5 hrs)

Components of a file, different operation of the file, communication in files, creation of file streams, stream classes, headerfiles, updating of file, opening and closing a file, file modes and filepointers and their manipulations, functions manipulation of file pointers, detecting end-of-file.

LIST OF PRACTICALS

1.   Write a function using variables as arguments to swap the values of a pair of integers
2.   Consider a shopping list of items for which we place an order with a dealer every month.The list includes such as the code number and price of each item .we would like to perform operations such as adding an item to the list,deleting an item from the list and printing the total value of the order.

3. Write a program to read name, roll no ,internal external marks using classes and display the same on the screen.
4. Write a program of swapping of numbers by accessing private numbers using friend function.
5. Define a class to represent a bank account using constructor including the following members:- Data members
   i) For Single Customer   ii) For n Customers
   a) Name of the depositors
   b) Account number
   c) Type of account
   d) Balance amount in the account
        Member function
        - To assign initial values
        - To deposit an amount
        - To withdraw an amount after checking the balance
        - To display the name and balance.
6. Create 2 classes OM and DB which store the value of distance. DM store distances in Meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB. Use a friend function to carry out the addition operation the object that stores the results may be a DM object or a DB object, depending upon the units in which the results are required. The display should be in the format of feet and inches or meters and cms depending on the object on display.

7. A book shop maintains the inventory of books that are being sold at the shop the list includes details such as author, title and publisher and stock position. Whenever a customer wants the book, the sales person inputs the title and author and the system search the list and display whether it is available ornot. If it is not, a appropriate message is displayed, if it is, then the system displays the book details and requests for the number of copies require. If the requested are available, the total cost of the required copies is displayed: otherwise the message" Required copies not in stock"is displayed. Design a system using a class called books with suitable member functions and constructors. Use new operator in constructor to allocate memory space require.

8. Define a class string that could work as a userdefined string type include constructors that will enable us to create an .un-initialized string
   String s1; :/ string with length 0 And also to initialize an object with string constant at the time of creation like String s2("well done"); . Include a function that adds two strings to make a third string.
9. Create a class float that contains 2 float data member. Over load all the 4 arithmetic operators so that do operate on the objects of float.

10. Programming Exercise on Hybrid Inheritance

11. Define 2 classes POLAR and RECTANGLE to represent points in the POLAR and RECTANGLE systems. Use conversion routines to convert from one system to the other.

12. Create a base class called shape. use this class to store two double type values that could be used to compute the area of fig. Derive the specific class called TRIANGLE and RECTANGLE from the data shape. Add to base class, a member function get - data ( ) to initialize base class data members and another member and another member function display – area( ) to compute and display the area of the fig.. Make display – area ( ) as a virtual function and redefine function in the derived classes to suit their requirements, Using these 3 classes design a program that will accept dimension of RECTANGLE or TRIANGLE interactivity and display the area.
Remember the 2 values given as input will be treated as length of 2 sides in the case of rectangle and as base and height in the case of triangles and used as follows:
Area of rectangle = x*y
Area of triangle = 1/2 *x*y

13. Exercise on file handling

RECOMMENDED BOOKS

1. C++: An introduction to programming by Jense Liberty Tim Keogh: BPB Publications, New Delhi
2. OO Programming in C++ by Robert Lafore: , Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
3. Object Oriented Programming Using C++, Sanjeev Sofat, Cyber Tech. Publication, New Delhi
4. Object Oriented Programming in C++ by E. Balaguruswamy, TMH Publishing Co. Ltd., New Delhi
5.   C++ Primer by Stephen Parata , TMH Publishing Co. Ltd., New Delhi

4.5   MICROPROCESSORS AND PERIPHERAL DEVICES

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4 - 2

RATIONALE

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer.   The development in microprocessors of 32 bit architecture brings them face-to-face with mainframe finding employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers. Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications.   Thus the microprocessor is an area of specialization.   Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

DETAILED CONTENTS

1.   Evolution of Microprocessor   (04 hrs)

Typical organization of a microcomputer system and functions of its various blocks. Microprocessor, its evolution, function and impact on modern society

2.   Architecture of a Microprocessor (With reference to 8085 microprocessor)   (12 hrs)

Concept of Bus, bus organization of 8085, Functional block diagram of 8085 and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus generation of read/write control signals, Steps to execute a stored programme

3.   Instruction Timing and Cycles   (08 hrs)

Instruction cycle, machine cycle and T-states, Fetch and execute cycle.

4. Programming (with respect to 8085 microprocessor) (16 hrs)

Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and Addressing mode. Identification of instructions as to which addressing mode they belong. Concept of Instruction set. Explanation of the instructions of the following groups of instruction set. Data transfer group, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group. Programming exercises in assembly language. (Examples can be taken from the list of experiments).

5. Memories and I/O interfacing (10 hrs)

Concept of memory mapping, partitioning of total memory space. Address decoding, concept of peripheral mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices.

6. Interrupts (04 hrs)

Concept of interrupt, Maskable and non-maskable, Edge triggered and level triggered interrupts, Software interrupt, Restart interrupts and its use, Various hardware interrupts of 8085, Servicing interrupts, extending interrupt system

7. Data Transfer Techniques (04 hrs)

Concept of programmed I/O operations, sync data transfer, async data transfer (hand shaking), Interrupt driven data transfer, DMA, Serial output data, Serial input data

8. Peripheral devices (06 hrs)

8255 PPI and 8253 PIT, 8257 / 8237 DMA controller, 8279 Programmable KB/Display Interface, 8251 Communication Interface Adapter.

LIST OF PRACTICALS

1. Familiarization of different keys of 8085 microprocessor kit and its memory map

2. Steps to enter, modify data/program and to execute a programme on 8085 kit

3. Writing and execution of ALP for addition and sub station of two 8 bit numbers

4. Writing and execution of ALP for multiplication and division of two 8 bit numbers

5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order

6. Writing and execution of ALP for 0 to 9 BCD counters (up/down counter according to choice stored in memory)

7. Interfacing exercise on 8255 like LED display control

8. Interfacing exercise on 8253 programmable interval timer

9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display

10. Use of 8085 emulator for hardware testing

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing). Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the given in the list may be given to the students.

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi

2. Introduction to Microprocessor by Mathur ,Tata McGraw Hill Education Pvt Ltd , New Delhi

3. Microprocessor and Microcontrollers by Dr BP Singh, Galgotia Publications, New Delhi

4. Microprocessor and Applications by Badri Ram: Tata McGraw Hill Education Pvt Ltd , New Delhi

5. Microprocessor and Microcomputers by Refiquzzaman, Prentice Hall of India Ltd., New Delhi.

6. Microprocessor programming & applications.by sudhir Goyal, North Publication.

7.   Digital Logic and Computer Design by Mano, M Morris; Prentice Hall of India, New Delhi

8.   Digital Electronics by Rajaraman; Prentice Hall of India Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1.	Evolution of Microprocessor	04	5
2.	Architecture of a Microprocessor (With reference to 8085 microprocessor)	12	20
3	Instruction Timing and Cycles	08	10
4	Programming (with respect to 8085 Microprocessor)	16	25
5.	Memories and I/O interfacing	10	15
6.	Interrupts	04	5
7.	Data transfer techniques	04	5
8.	Peripheral devices	06	15
Total		**64**	**100**

INDUSTRIAL TRAINING OF STUDENTS
(after IV Semester examinations)

Industrial training, provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 4 weeks duration to be organised during the semester break starting after second year i.e. after IV Semester examinations. The concerned HODs along with other teachers and TPO will guide and help students in arranging appropriate training places relevant to their specific branch. The Training and Placement office of the institute will identify and earmark the Company/ Industries/ Oranization for training in consultion with concerned HOD. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.