SEMESTER – II

BCA 2011: Data Structures

Course Learning Outcomes: (After the completion of course, the students will have ability to):

- **To be familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles**
- **To have knowledge of complexity of basic operations like insert, delete, search on these data structures.**
- **Ability to choose a data structure to suitably model any data used in computer applications.**
- **Design programs using various data structures Binary and general search trees, heaps etc.**
- **Ability to assess efficiency tradeoffs among different data structure implementations.**

Implement and know the applications of algorithms for sorting, searching etc.

Credit :3 45Hours

Introduction: Introduction to algorithm, analysis for space and time requirements. **5hours**

Linear data structures and their sequential representation: Array, Stack, queue, circular queue, dequeue and their operation's and applications**.** **10hours**

Linear data structures and their linked representation: linear linked list, doubly linked list, linked stack and linked queue and their operation's and applications. **10hours**

Nonlinear data structure: Binary trees, binary search trees, representations and operations. Thread representations, sequential representations, graphs, and their representation. **10hours**

Searching: linear search and binary search **5hours**

Sorting: bubble, insertion, selection, quick and merge sort. **5hours**

Books:

1. Data Structure using C- A.M. Tanenbaum (PHI)

BCA 2011: Data Structures C (Practical)

Credit :1 30Hours

All programs should be developed in C

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.

2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.

3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).

4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

6. Perform Stack operations using Linked List implementation.

7. Perform Stack operations using Array implementation. Use Templates.

8. Perform Queues operations using Circular Array implementation. Use Templates.

9. Create and perform different operations on Double-ended Queues using Linked List implementation.

10. WAP to scan a polynomial using linked list and add two polynomial.

11. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration

12. (ii) WAP to display fibonacci series (i)using recursion, (ii) using iteration

13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion

14. WAP to create a Binary Search Tree and include following operations in tree:

(a) Insertion (Recursive and Iterative Implementation)

(b) Deletion by copying

(c) Deletion by Merging

(d) Search a no. in BST

(e) Display its preorder, postorder and inorder traversals Recursively

(f) Display its preorder, postorder and inorder traversals Iteratively

(g) Display its level-by-level traversals

(h) Count the non-leaf nodes and leaf nodes

(i) Display height of tree

(j) Create a mirror image of tree

(k) Check whether two BSTs are equal or not

15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.

16. WAP to reverse the order of the elements in the stack using additional stack.

17. WAP to reverse the order of the elements in the stack using additional Queue.

18. WAP to implement Diagonal Matrix using one-dimensional array.

BCA 2021: Mathematics-II

This course introduces the students to the fundamental concepts and topics of probability and statistics, whose knowledge is important in other computer science courses.

Course Learning Outcomes After successful completion of this course, the student will be able to:

- **Use probability theory to evaluate the probability of real-world events.**
- **Describe discrete and continuous probability distribution functions and generate random numbers from the given distributions.**
- **Find the distance between two probability distributions**
- **Define and quantify the information contained in the data.**
- **Describe various algorithms of Numerical Methods.**

Credit :4 60Hours

Probability and Statistics: Permutation and Combinations, Probability, Classical definition of probability. Conditional probability. Statistical independence of events. Random variable and its expectation and variance, joint dispersion of attributes. 10 hours

Collection and presentation of data. Frequency distribution. Measures of central tendency. Measures of dispersion. Binomial, Poission and Normal distribution. 5 hours

Bivariate Frequency Distributions (scatter Diagram, Correlation coefficient and its properties, regression lines, correlation index and correlation ratio, rank correlation). 5 hours

Multiple linear regression, multiple correlation, partial correlation (for 3 variables only). 5 hours

Random sampling, expectations and standard error of sampling mean. Expectation and standard error of sampling proportions. 5 hours

Test of significance based on t, F, and CHI square distribution. 5 hours

Numerical Methods and Algorithms Solution of non-linear equations: Bisection, Newton-Raphson, Regular-Falsi and Secant method. Interpolation and approximation- Lagrange Interpolation, Newton's Forward Interpolation and Newton's backward Interpolation methods. Integration: Trapizoidal and Simpson's 1/3 rules. Solution of linear equations: Gaussian elimination, Gauss Sheidal method Solution of different equations; Eular's, Taylor's series, Runge-kutta (order-2) 25 hours

Books:

1. C Language and Numerical Methods C Xaviers, New Age International

2. Fundamentals of Statistics – Goon, Gupta, DasGupta

BCA 2051 : Python Programming

Course Learning Outcomes: After successful completion of the Course a student will be able to:

- **Learn the basic knowledge of Python. • Students will be able to acquire programming skills in core Python.**
- **Students will be able to acquire Object Oriented Skills in Python.**
- **Students will be able to solve problems requiring the writing of well-documented programs in The Python language, including use of the logical constructs of that language.**

Credit :3 90Hours

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. **06hours**

Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming**.** **10hours**

Overview of Programming: Structure of a Python Program, Elements of Python **04hours**

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator,

Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). **10hours**

Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions. **10hours**

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. Data Structures: Arrays, list, set, stacks and queues. **20hours**

Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting. **04 hours**

Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessingelements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists. **14hours**

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. **04hours**

Data Structures: Arrays, list, set, stacks and queues. **04hours**

Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting. **04hours**

Software Lab Based on Python:

Section: A (Simple programs)

 Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon users choice.

 WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :

Grade A: Percentage >=80

Grade B: Percentage>=70 and <80Grade C:

Percentage>=60 and <70Grade D:

Percentage>=40 and <60 Grade E:

Percentage<40

Section: B (Visual Python):

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D

objects I. curve

II.

sphere

III. cone

IV. arrow

V. ring

VI. cylinder.

2. WAP to read n integers and displaythem as a histogram.

3. WAP to displaysine, cosine, polynomial and exponential curves.

4. WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be

entered by the user.

5. WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula m=60/(t+2), where t is the time in hours. Sketch a graph for t vs. m, where t>=0.

6. A population of 1000 bacteria is introduced into a nutrient medium. The population p Grows as follows:

P(t) = (15000(1+t))/(15+ e)

where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.

7. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:

I. velocitywrt time (v=u+at)

II. distance wrt time (s=u*t+0.5*a*t*t)

III. distance wrt velocity (s=(v*v-u*u)/2*a)

Books:

(i) T. Budd, Exploring Python, TMH, 1st Ed, 2011

ii. How to think like a computer scientist : learning with Python / Allen Downey, Jeffrey Elkner, Chris

Meyers. 1st Edition – Freely available online.2012

1. http://docs.python.org/3/tutorial/index.html

2. http://interactivepython.org/courselib/static/pythonds

Comm2031:Fundamentals of Management

Marks: 50 Course Evaluation: Semester Examination (40 Marks) and Internal Assessment (10 Marks)
Credit: 3 Lectures: 48
Objectives The basic objective of this course is to provide students with a comprehensive understanding of the basic concepts and various functions of management which will help them in developing skills for application of management principles in business organizations.
Course Outcomes: After successful completion of the course, students will be able to:

1. Understand and identify the management principles and practices which are relevant to organizations.
2. Apply the acquired knowledge in managerial functions.

CONTENTS

Units 1: Introduction to Management 12 Lectures

Meaning and Definition, Nature, Characteristics, Scope, Levels and Functions of Management, Administration Vs. Management, Essence of Management, Evolution of management thought: contributions of F.W. Taylor and Henry Fayol.

Units 2: Planning 10 Lectures

Meaning and Definition, Characteristics of Planning, Importance and Benefits of Planning, Steps in Planning, Types of Planning, Limitations of Planning, Decision making (concept only).

Units 3: Organising 10 Lectures

Concept and process of organising, Span of management, Different types of authority (line, staff and functional), Decentralisation, Delegation of authority, Formal and Informal Structure, Principles of Organising.

Units 4: Staffing, Directing and Controlling 16 Lectures

a) Staffing: Concept, Process.
b) Directing: Meaning, Nature, Significance, Principles and Techniques.
c) Motivation: Concept, Importance, Motivation theories: Maslow's Need-Hierarchy Theory, Hertzberg's Two-factor Theory.
d) Leadership: Concept, Importance, Qualities of a good leader, Types of Leadership styles.
e) Controlling: Concept, Importance, Process, Limitations, Essentials of Effective Control System; Techniques of Control.

Suggested Readings

1. Koontz and O'Donnell, Principles of Management, McGraw Hill Education.
2. C.B. Gupta, Business Management, Sultan Chand and Sons.
3. L.M. Prasad , Principles and Practice of Management, Sultan Chand and Sons.
4. A.F. Stoner and R.E. Freeman, Management, Prentice Hall.
5. P.C. Tripathi and P. N. Reddy, Principles of Management, TMH Publications.
6. Griffin, Management Principles and Application, Cengage Learning.
7. Harold Koontz and Heinz Weihrich, Essentials of Management: An International and Leadership Perspective, McGraw Hill Education.
8. B.P. Singh and A.K.Singh, Essentials of Management, Excel Books.
9. T.N. Chhabra, Management Concepts and Practice, Dhanpat Rai& Co. (Pvt. Ltd.).