SVKM's NMIMS
Mukesh Patel School of Technology Management & Engineering

Program:	B. Tech. (I.T., Computer, EXTC, Mechanical, Civil, Mechatronics & Data Science)				Semester: II	
Course/Module:	Programming for Problem Solving				Module Code:	BTIT02009, BTCO02009, BTET02009, BTME02009, BTCI02009, BTMA02009, BTDS02009
Teaching Scheme					Evaluation Scheme	
Classroom Session	Lecture (Hours per week)	Tutorial (Hours per week)	Practical/ Group work (Hours per week)	Credit	Continuous Evaluation (Marks-50)	Term End Examinations (TEE) (Marks - 100 in Question Paper)
42	3	0	4	5	Marks Scaled to 50	Marks Scaled to 50

Course Rationale:

This course aims to teach the fundamental concepts of Procedural Programming. Students will develop skills related to problem solving by writing computer programs. This course does not require any prior programming experience.

Course Objectives:

1. To enable students understand the basic concepts of Programming and help them build Programming Logic.
2. To develop problem solving skills using basic Programming constructs, Decision Making and Looping.
3. To enable students solve complex problems using the knowledge of Arrays, Functions, Structures and Pointers.

Course Outcomes:

After completion of the course, students would be able to :

1. formulate algorithms and draw flowcharts for arithmetic and logical problems
2. implement Decision Making, Nested Control Structures and Iterations
3. implement programs using Functions and concept of Recursion
4. demonstrate the use of Arrays, Strings, Structures and Pointers
5. apply Programming knowledge to solve searching and sorting problems

Pedagogy:

Peer learning, Group exercises, quizzes, presentations and lecture method

Textbooks:

TB1. *Schaum's Outline Programming with C*, 3 e, Byron Gottfried, McGraw-Hill, 2017.
TB2. *Programming in ANSI C*, 7 e, E. Balaguruswamy, Tata McGraw Hill Education, 2017.

Reference Books:

RB1. *The C Programming Language*, 2 e, Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall of India, 1988.
RB2. *Schaum's Outlines Data Structures*, Revised 1 e, Seymour Lipschutz, Tata McGraw Hill, 2014.

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Links to websites:

- https://cprogrammingcodes.blogspot.in/2011/09/algorithms-and-flowchart.html

Evaluation Scheme:

• Tutorial Test/Presentation/viva/quiz	20%
• Mid Term	30%
• Term End Exam	50%
Total	**100%**

Session Plan:

Session	Topics	Session\ Course Outcomes	Pedagogical Tool	Textbook Chapters & Readings
Unit 1	**Introduction to Programming**	**CO1**	--	--
1.	Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)	Formulate algorithms	Lectures	**TB1:** Chapter 1: Introductory Concepts
2.	**Idea of Algorithm:** • Steps to solve logical and numerical problems. **Representation of Algorithm:** • Flowchart/Pseudo code with examples	• Formulate algorithms • Draw flowcharts for arithmetic and logical problems		**TB1:** Chapter 1: Introductory Concepts
3.	**From algorithms to programs:** • Source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code	Formulate algorithms		**TB1:** Chapter 2: Introduction to C programming **TB2:** Chapter 1: Overview of C Chapter 2: Constants variables and data types
Unit 2	**Basic Programming Constructs**	**CO2**	--	--
4.	**Operators**	Evaluate arithmetic and logical operator	• Lectures • Presentations • Quizzes	**TB1,TB2:** Chapter 3: Operators and expressions
5.	**Expressions**	Evaluate arithmetic and logical expressions		**TB1:** Chapter 5: Control
6.	**Decision making and Branching:** • If statements and if else statement	Implement Decision Making		

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7.	**Nesting of if else statements and Else if ladder**	Implement Decision Making		Statements **TB2:** Chapter 5: Decision making and branching
8.	**Switch statements**	Implement Decision Making and nested control		
9.	**Continue statement Break statement**	Implement Decision Making and nested control		
10.	**Looping – while**	Implement iteration loop		**TB1:** Chapter 6: Control Statements **TB2:** Chapter 6: Decision making and looping
11.	**do-while**	Implement iteration loop		
12.	**For loops**	Implement iteration loop		
13.	**For loops and Finding roots of equations**	Implement iteration loop and iterations		
14.	**Nested loops**	Nested Control Structures and iterations		
Unit 3	**Arrays and Strings**	**CO4**	--	--
15.	• Concept, declaration, initialization • Accessing array elements of one-dimensional array	Demonstrate the use of Arrays	• Lectures • Problem Solving • Quizzes	**TB1:** Chapter 9: Arrays **TB2:** Chapter 7: Arrays
16.	**One-dimensional array**	Demonstrate the use of Arrays		
17.	• Concept, declaration, initialization • Accessing array elements of two-dimensional array	Demonstrate the use of Arrays		
18.	**Two - dimensional array**	Demonstrate the use of Arrays		
19.	**Introduction to strings**	Demonstrate the use of strings		
Unit 4	**Functions**	**CO3**	--	--
20.	**Function** • Introduction and need of user defined functions	Implement programs using Functions	• Lectures • Problem Solving • Quizzes	**TB1:** Chapter 7: Functions **TB2:** Chapter 9: User defined functions
21.	• Defining a Function • Function calls and declaration	Implement programs using Functions		
22.	**Category of functions:** • No argument and no return value • Argument but no return value	Implement programs using Functions		

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23.	**Category of functions:** • Argument with return value • No argument but return value	Implement programs using Functions		
24.	**Passing arrays to functions**	Implement programs using Functions		**TB1:** Chapter 9: Arrays **TB2:** Chapter 9: User defined functions, Character arrays and strings
25.	Declaring & initialising string variable, Reading & writing strings	Demonstrate the use Strings		
26.	String handling functions	Demonstrate the use Strings		
27.	Passing strings to functions	Demonstrate the use Strings		
Unit 5	**Recursion**	**CO3**	--	--
28.	**Introduction to Recursion** • Recursion as a different way of solving problems adjoint method	Implement programs using concept of Recursion	• Lectures • Problem Solving • Presentation	**TB1:** Chapter 7: Functions **TB2:** Chapter 9: User defined functions
29.	**Recursion programs:** • Examples - Finding Factorial, Fibonacci series	Implement programs using concept of Recursion		
30.	**Recursion programs:** • Examples GCD, Merge sort.	Implement programs using concept of Recursion		
Unit 6	**Structures**	**CO4**	--	--
31.	• Defining a Structure Declaring structure variables • Accessing structure members • Structure Initialization	Demonstrate the use of structures	• Lectures • Problem Solving • Quizzes • Presentation	**TB1:** Chapter 11: Structure and unions **TB2:** Chapter 10: Structure and unions
32.	Array of Structure	Demonstrate the use of structures		
33.	Structure within structure	Demonstrate the use of structures		
34.	Difference between Structure and Unions	Demonstrate the use of structures		
Unit 7	**Pointers**	**CO4**	--	--
35.	• Idea of pointers • Defining pointers	Demonstrate the use of pointers	• Lectures • Problem Solving • Quizzes • Presentatio	**TB1:** Chapter 10: Pointers **TB2:** Chapter 11: Pointers
36.	Call by value and call by reference	Demonstrate the use of pointers		

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37.	Use of Pointers in self-referential structures, Notion of linked list (no implementation)	Demonstrate the use of pointers	n	**TB1:** Chapter 11: Structure and unions **TB2:** Chapter 13: Dynamic memory allocation and linked
Unit 8	**Basic Algorithms**	**CO5**	--	--
38.	Notion of order of complexity through example programs (no formal definition required	Apply Programming knowledge to solve searching and sorting problems	• Lectures • Problem Solving • Quizzes • Presentation	
39.	Searching: Sequential search	Apply Programming knowledge to solve searching		
40.	Basic Sorting Algorithms : Bubble sort	Apply Programming knowledge to solve sorting problems		**RB2:** Chapter 9: Sorting and searching
41.	Insertion sort	Apply Programming knowledge to solve sorting problems		
42.	Selection sort	Apply Programming knowledge to solve sorting problems		

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Signature
(Approved by Dean)

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Program: B. Tech. –Data Science (Business Analytics)				**Semester : III**	
Course/Module: Data Structure and Algorithm				**Module Code: BTDS03002**	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks -50)**	**Term End Examinations (TEE) (Marks -100 in Question Paper)**
3	**4**	**0**	**5**	**Marks Scaled to 50**	**Marks Scaled to 50**

Pre-requisite: Computer Programming – I (basic programming skills)

Objectives:

- To provide knowledge of data structure and its type
- To provide advanced computer Science Programming of different data structure background for complex programming skill

Outcomes:

After completion of the course, students would be able to :

- distinguish data and information
- learn about data structure
- define various types of data structures
- know different data structure operations
- describe about data types in C
- define abstract data types

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1	**Introduction to Data Structures:** Introduction to the theory of data structure, classification of data structure, Data representation, Abstract data types with examples, Data types Recursion: Recursive definition, recursion to solve the real life problems, Importance of data structures, Fundamental of operations of various data structures such as array, Structure etc.	4
2	**Array, stack and Queues**" Array, Stack and queue representation, Operation and examples, Polish notation, stack in recursion Queue, Queue processing, Types of Queues: Circular queues and priority queues, Role of data structure in optimized coding	10
3	**List and Linked lists:** Linked list and array, Dynamic linked lists (single, doubly, circular) – processing, operations, applications of linked lists	7
4	**Tree:** Concept of trees, Binary tree and its representation, complete binary tree, tree traversal algorithms, in-order, preorder, post-order, Height balanced tree, Threaded binary tree, Expression tree and game tree, Huffman algorithm and its applications Search Trees: Binary search tree, insertion and deletion, AVL tree, M-way search tree, B tree and B+ tree (including insertion and deletion). Applications of tree data structures to solve real life problems	10

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5	**Graph**: Terminology, sequential and linked representation of graphs, adjacency matrices, Adjacency list, adjacency multi list, graph traversal: breadth first search and Depth first search, connected component, spanning trees, minimum cost spanning tree, Prims and Kruskal algorithms, transitive closure and shortest path algorithm, Application of graph to solve the real life problems.	6
6	**Searching, Sorting and Hashing:** General background, Basic search techniques, sequential searching, bubble sort, selection sort, insertion sort, Shell sort and Radix sort and their efficiency, Quick sort and merge sort comparison, indexed sequential searching, binary search, Hashing: Basics, collision resolution and their efficiency comparison, Application of search and indexes to solve real life problems.	8
Total		45

Text Books:

1.C and Data Structure, P.S. Deshpande and O.G. Kakde, CHARLES RIVER MEDIA, INC. Hingham, Massachusetts (pdf version)
2. Reema Thareja, "Data Structure using C", Oxford University Press, 2nd Edition, 2014
3. Y. Langsam, M.J. Augenstein, A.M. Tenenbaum; "Data structure using C and C++", 2nd Edition, PHI2004
4. Seymour Lipschutz, "Data Structures", Schaum's Outlines, Tata McGraw Hill, 2006

Reference Books:

1. Richard F. Gillberg, Behrouz A. Forouzen, "Data Structure – A Pseudo Approach with C", Cengage Publication, 2005
2. G.S. Baluja, "Data Structure through C (A practical approach)", Dhanpat rai and co. 4th edition, 2014

Any other information: NIL

Total Marks of Internal Continuous Assessment (ICA): 50 Marks

Distribution of ICA Marks:

Description of ICA	**Marks**
Test Marks	**20**
Term Work Marks	**30**
Total Marks :	**50**

Details of Term work:

1. Minimum: Practical based on 10 Experiments
2. Minimum Two class tests.
3. Minimum two assignments

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