PRESIDENCY UNIVERSITY

(Established under the Presidency University Act, 2013 of the Karnataka Act 41 of 2013)

[2023-24 FALL/ODD SEMESTER]

COURSE HAND OUT/ COURSE PLAN [Revision 03 – July 2023]

SCHOOL: SOCSE&IS DEPT: CSE DATE OF ISSUE: 16.08.2023

NAME OF THE PROGRAM	**:** B.Tech in Computer Science and Engineering
P.R.C.APPROVAL REF.	**:** PU/AC-17/CSE/2021-2025/2021
SEMESTER/YEAR	**: III/II**
COURSE TITLE & CODE	**:** CSE 2001 - Data Structures and Algorithms
COURSE CREDIT STRUCTURE	**:** 3-2-4
CONTACT HOURS	**: 5 Hrs Per Week**
COURSE IC	**:** Dr. Joseph Michael Jerard V, Dr. Manjula H M, Dr. Smitha Patil
COURSE INSTRUCTOR(S)	**:** Dr. Joseph Michael Jerard V, Dr. Manjula H M, Dr. Smitha Patil, Dr. M. Chandra Sekhar, Mr. SUNIL KUMAR R M, Mr. PRASAD P S, Mr. MD ZIAUR RAHMAN, Dr.Raghavendra T S, Ms. SRIDEVI S, Dr. Saira Banu Atham, Ms. Hajeera Nikhat Khanam, Ms. Ramyavathsala C V, Mr. MOHAMED SHAKIR, Dr. HarishKumar K S, Mr.S. Aarif Ahamed, Mr.GNANAKUMAR G, Ms.SANDHYA L Mr. Asad Mohammed Khan, Ms. SOUMYA, Mr. PAJANY M Ms. Meena Kumari K S, Mr. M. Muthukumar, Ms. ROHINI A Mr. ARUN KUMAR S, Ms. Kayalvizhi, Ms. Manish M Goswami
COURSE URL	**: https://www.camu.in/index**

PROGRAM OUTCOMES:

Graduates of the B. Tech. Program in Computer Science and Engineering will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES:

PSO 01: [Problem Analysis]: Identify, formulate, research literature, and analyze complex engineering problems related to Software Engineering principles and practices, Programming and Computing technologies reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PSO 02: [Design/development of Solutions]: Design solutions for complex engineering problems related to Software Engineering principles and practices, Programming and Computing technologies and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PSO 03: [Modern Tool usage] : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities related to Software Engineering principles and practices, Programming and Computing technologies with an understanding of the limitations.

Skill Sets: Employability and Skill development

The students shall be able to develop:

SK1. An Attitude of Enquiry

SK2. Confidence and ability to tackle new problems

SK3. An ability to work as a leader and as a member of a team

SK4. Assess errors and eliminate them

SK5. Write reports

SK6. Select suitable software.

SK7. Predict the required output for the given problem.

Sl. No	**Skill Set**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 1 1**	**PO 12**
1	An Attitude of Enquiry		✓										

2	Confidence and ability to tackle new problems	✓	✓	✓		✓							
3	Ability to work as a leader and as a member of a team			✓									
4	Assess errors and eliminate them			✓									
5	Write reports										✓		
6	Select suitable software					✓							✓
7	To predict the required output for the given problem.		✓	✓									

COURSE PREREQUISITES: Problem Solving Using Java

COURSE DESCRIPTION: This course introduces the fundamental concepts of data structures and to emphasize the importance of choosing an appropriate data structure and technique for program development. This course has theory and lab component which emphasizes on understanding the implementation and applications of data structures using Java programming language. With a good knowledge in the fundamental concepts of data structures and practical experience in implementing them, the student can be an effective designer, developer for new software applications.

COURSE OBJECTIVE:

The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING techniques.

COURSE OUTCOMES: After the completion of the course students shall be able to:

TABLE 1 : COURSE OUTCOMES		
CO No.	**CO**	**Expected Bloom Level**
CO1	Implement program for given problems using fundamentals of data structures .	Apply

CO2	Apply an appropriate linear data structure for a given scenarios	Apply
CO3	Apply an appropriate non−linear data structure for a given scenarios	Apply
CO4	Explain the performance analysis of given searching and sorting algorithms	Analyze

MAPPING OF C.O. WITH P.O.: [H-HIGH, M- MODERATE, L-LOW]

TABLE 2a: CO PO Mapping ARTICULATION MATRIX												
CO No.	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO1	M	H	M	-	M	-	-	-	-	L	-	M
CO2	M	H	H	-	M	-	-	-	-	L	-	M
CO3	M	H	H	-	M	-	-	-	-	L	-	M
CO4	M	H	M	-	M	-	-	-	-	L	-	M

MAPPING OF C.O. WITH P.S.O.: [H-HIGH, M- MODERATE, L-LOW]

TABLE 2b: CO PSO Mapping ARTICULATION MATRIX			
CO No.	**PSO 1**	**PSO 2**	**PSO 3**
CO1	H	M	M
CO 2	H	H	M
CO3	H	H	M
CO4	H	M	M

COURSE CONTENT (SYLLABUS):

Module: 1: Introduction to Data Structure and Linear Data Structure – Stacks and Queues.

[18 Hrs - L[10] + P[8]] [Apply]

Introduction – Introduction to Data Structures, Types and concept of Arrays.

Stack - Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

Queues - Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Module: 2: Linear Data Structure- Linked List [18 Hrs – L[10] + P[8]] [Apply]

Linked List - Singly Linked List, Operation on linear list using singly linked storage structures, Circular List, Applications of Linked list.

Recursion - Recursive Definition and Processes, Programming examples.

Module 3: Non-linear Data Structures - Trees and Graph [16 Hrs – L[10] + P[6]] [Apply]

Trees - Introduction to Trees, Binary tree: Terminology and Properties, Use of Doubly Linked List, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post - Order traversal.

Graph - Basic Concept of Graph Theory and its Properties, Representation of Graphs.

Module 4: Searching & Sorting Performance Analysis [16Hrs – L[10] + P[6]] [Analyse]

Sorting & Searching - Sequential and Binary Search, Sorting – Selection and Insertion sort.

Performance Analysis - Time and space analysis of algorithms – Average, best and worst case analysis.

List of Experiments

Sl. No	Experi-ment No.	Experiment Name	List of skill set	COs
1	P1	Programming using Basic Concepts of Java Programming	SK – 1, 2, 3, 5, 7, 8 and 14	CO1
2	P2	Programming on Stack	SK – 1, 2, 3, 5, 7, 8 and 14	CO1& CO2
3	P3	Programming using Stack	SK – 1, 2, 3, 5, 7, 8 and 14	CO1 & CO2
4	P4	Programming using Queue	SK – 1, 2, 3, 5, 7, 8 and 14	CO1 & CO2
		Lab Sheet 1 (4 Practical) Completed		
5	P5	Programming on Linked List	SK – 1, 2, 3, 5, 7, 8 and 14	CO2
6	P6	Programming using Linked List	SK – 1, 2, 3, 5, 7, 8 and 14	CO2

7	P7	Programming on Recursion	SK – 1, 2, 3, 5, 7, 8 and 14	CO3
8	P8	Programming using Recursion	SK – 1, 2, 3, 5, 7, 8 and 14	CO3
		Lab Sheet 2 (4 Practical) Completed		
9	P9	Programming on Doubly linked list	SK – 1, 2, 3, 5, 7, 8 and 14	CO3
10	P10	Programming on Binary Tree and Graph	SK – 1, 2, 3, 5, 7, 8 and 14	CO3
		Lab Sheet 3 (2 Practical) Completed		
11	P11	Program to analyze the performance of Searching algorithm	SK – 1, 2, 3, 5, 7, 8 and 14	CO4
12	P12	Program to analyze the performance of Sorting algorithm	SK – 1, 2, 3, 5, 7, 8 and 14	CO4
		Lab Sheet 4 (2 Practical) Completed		

DELIVERY PROCEDURE (PEDAGOGY): The course primarily uses Traditional classroom teaching along with Problem based Learning, Participative Learning, Self-Learning and Technology Enabled Learning

TABLE 3: SPECIAL DELIVERY METHOD/ PEDAGOGY PLANNED WITH TOPICS

Sl. No	Lecture Number	Subtopic as per lesson Plan	Pedagogy title/ short explanation of adopted pedagogy	** At end of semester please update whether activity was done	Comments
1	L7	Application of Stack	Participative Learning		
2	L18 & L19	Implementation of Stack & Queue using Linked List	Participative Learning		
3	L18 & L19	Insertion / search of a node at	Self Learning		

		particular position in Linked List			
4		Students should complete the lab programs by end of each practical session and module wise assignments before the deadline.	Problem Based Learning	:	

REFERENCE MATERIALS:

(i) Textbook(s)

T1. Narasimha Karumanchi: *"Data Structures and Algorithms Made Easy in Java"*, 5th Edition, CareerMonk Publications, 2017.

(ii) Reference Book(s)

R1. Mark Allen Weiss: *"Data Structures and Algorithm Analysis in Java"*, 4th Edition, Pearson Educational Limited, 2014.

R2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: *"Data Structures and Algorithms in Java"*, 6th Edition, John Wiley & Sons, Inc., ISBN: 978-1-118-77133-4, 2014.

R3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 2017: *"Introduction to Algorithms"*, 3rd Edition, PHI Learning Private Limited.

(iii) Additional web-based resources

W1. NPTEL course – For theory: https://onlinecourses.nptel.ac.in/noc20_cs85/preview

W2. https://puniversity.informaticsglobal.com/login

GUIDELINES TO STUDENTS:

1. Preparatory work for lab sessions is mandatory.
2. Suggestion to view NPTEL videos on related topics.
3. Practice more exercises as self-study.

COURSE SCHEDULE:

TABLE 4: COURSE BROAD SCHEDULE				
Sl. No.	**ACTIVITY**	**STARTING DATE**	**CONCLUDING DATE**	**TOTAL NUMBER OF PERIODS**
1	Over View of the course	28/08/2023	28/08/2023	1
2	Module : 01	29/08/2023	20/09/2023	10
3	Module: 02	21/09/2023	13/10/2023	10
4	Module: 03	23/10/2023	17/11/2023	10
5	Module : 04	20/11/2023	15/12/2023	10
6	Last Instruction Day	22/12/2023		
7	Lab Sheet – 1	29/08/2023	20/09/2023	8
8	Lab Sheet – 2	21/09/2023	13/10/2023	8
9	Mid Term Theory Exam	As per COE		
10	Lab Sheet – 3	23/10/2023	17/11/2023	6
11	Lab Sheet – 4	20/11/2023	15/12/2023	6
12	Last Instruction Day	22/12/2023		

DETAILED SCHEDULE OF INSTRUCTION:

TABLE 5: DETAILED COURSE SCHEDULE/ LESSON PLAN					
Session No	**Lesson Title**	**Topics**	**Course Outcome Number**	**Delivery Mode**	**Reference**
L1	Introduction to Course	-	-	PPT	Course Handout
L2	Rewind Java	Programming Constructs of Java	CO1	PPT	T1
L3	Introduction	Arrays, read and retrieve	CO1	PPT	T1
L4	Linear Data Structure	Stack Concepts and representation	CO1 & CO2	PPT	T1, R1
L5	Stack	Operations with the conditions		PPT	
L6	Stack	Implementations	CO1 & CO2	PPT	T1, R1
L7	Stack	Applications		PPT	
L8	Linear Data Structure	Queue Representation and Operations with the conditions	CO1 & CO2	PPT	T1, R1
L9	Queue	Types of Queue: Circular queue& Double ended queue	CO1 & CO2	PPT	T1, R1
L10	Queue	Implementations		PPT	
L11 -Student Presentation		Applications of Queue			PPT
END OF MODULE 1					
L12	Module Integration				
L13	Linked List	Introduction	CO2	PPT	T1
L14	Singly Linked List	Node Representation and its structure creation	CO2	PPT	T1, R1
L15		Insertion & Deletion Operations on linear list using singly linked list representation		PPT	

L16	Circular List	Representation and its Node structure	CO2	PPT	T1, R1
L17		Operations: insertion and Deletion with conditions		PPT	
L18	Applications of Linked list	Stack using Linked List	CO2	PPT	T1, R1
L19		Queue using Linked List		PPT	
L20	Recursion	Methodology & Recursion on stack	CO2	PPT	T1, R1
L21	Recursion	Recursion on stack with more Examples	CO2	PPT	T1, R1
END OF MODULE 2					
L22	Module Integration	CO2 & CO3		PPT	
L23	Trees	Introduction to Trees	CO3	PPT	T1, R2
L24		Binary tree: Terminology and Properties		PPT	T1, R2
L25	Doubly Linked List	Use of DLL and its representation	CO3	PPT	T1, R2
L26	Binary tree	Introduction and construction	CO3	PPT	T1, R2
L27		Binary tree Traversal: Pre-Order traversal		PPT	T1, R2
L28		In-Order & Post-Order traversal		PPT	T1, R2
L29	Graph	Basic Concept of Graph Theory and its Properties	CO3	PPT	T1, R2
L30		Representation of Graphs.	CO3	PPT	T1, R2
L31- Student Presentation		Representation Of Graphs			PPT
END OF MODULE 3					
L32	Module Integration	CO3 & CO4			
L33	Analysis of Algorithms & its types	Introduction - Worst, Best and Average	CO4	PPT	T1, R1,R3
L34	Asymptotic Notation:	Big O, Ω and Θ Exercise Examples	CO4	PPT	T1, R1,R3
L35		Guidelines for Asymptotic Analysis		PPT	T1,R3
L36	Analysis Computations	Commonly used Logarithms and Summations	CO4	PPT	T1, R1,R3
L37	Algorithms Analysis	Problems & Solutions	CO4	PPT	T1, R1,R3
L38	Searching	Performance Analysis of Linear Search with example	CO4	PPT	T1, R1,R3
L39		Performance Analysis of Binary Search with example		PPT	T1, R1,R3
L40	Sorting	Performance Analysis of Selection Sort and Insertion Sort	CO4	PPT	T1, R1,R3
L41	Revision	Module 4	CO4	PPT	T1, R1,R3
END OF MODULE 4					

COURSE CONTENT &TASK SCHEDULE FOR LABORATORY COMPONENT:

Sl. No	Session Number and Date	Task No	Task	Level 01	Level 02	Number of Lab Sessions required to complete the task	Skills to be developed	Course Outcome to be developed
1	P1	Task-1	Programming using Basic Concepts of Java Programming	Prompt the user, read input and print messages Programs using class, methods and objects	Programming Exercises on fundamental Data structure - Arrays based on Scenario	2	SK - 1, 2, 3, 5, 7, 8 and 14	CO1
2	P2	Task-2	Programming on Stack	Programming Exercises on Stack and its operations	Programming Exercises on Stack and its operations with condition	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO1& CO2
3	P3	Task-3	Programming using Stack	Programming on Stack application infix to postfix Conversion	-	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO1 & CO2
4	P4	Task-4	Programming using Queue	Programming Exercises on Queues and its operations with conditions	-	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO1 & CO2
5	P5	Task-5	Programming on Linked List	Programming Exercises on Linked list and its operations.	Programming Exercises on Linked list and its operations with various positions	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO2
6	P6	Task-6	Programming using Linked List	-	Programming scenario based application using Linked List	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO2
7	P7	Task-7	Programming on Recursion	Programming Exercises on factorial of a number	Programming the tower of Hanoi using recursion	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO3

Sl. No	Session Number and Date	Task No	Task	Level 01	Level 02	Number of Lab Sessions required to complete the task	Skills to be developed	Course Outcome to be developed
8	P8	Task-8	Programming using Recursion	-	Programming the tower of Hanoi using recursion	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO3
9	P9	Task-9	Programming on Doubly linked list	Programming Exercise on Doubly linked list and its operations	-	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO3
10	P10	Task-10	Programming on Binary Tree and Graph	Program to Construct Binary Search Tree and Graph	Program to traverse the Binary Search Tree in three ways)in-order, pre-order and post-order(and implement BFS and DFS	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO3
11	P11	Task-11	Program to analyze the performance of Searching algorithm	Program to Implement the Linear Search & Binary Search	Program to Estimate the Time complexity of Linear Search	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO4
12	P12	Task-12	Program to analyze the performance of Sorting algorithm	Program to Implement and Estimate the Time complexity of Insertion and Selection Sort	Program to Implement and Estimate the Time complexity of Insertion Sort	**1**	SK - 1, 2, 3, 5, 7, 8 and 14	CO4

ASSESSMENT SCHEDULE FOR THEORY AND LABORATORY COMPONENT:

TABLE 6 ASSESSMENT SCHEDULE							
Sl.no	**Assessment type**	**Contents**	**Course outcome Number**	**Duration In Hours**	**Marks**	**Weightage**	**Venue, DATE &TIME**
1	Surprise Test 1	Module 1	CO1	30 minutes	10	5%	
2	Quiz	Module 1 & 2	CO2	30 minutes	10	5%	
3	Mid Term	Module 1, 2	CO1,CO2	1 hour 30 minutes	50	25%	

4	Surprise Test 2	Module 3 & 4	CO3	30 minutes	10	5%	
5	CIA	Module 1,2,3,4	CO1, CO2, CO3, CO4		20	10%	
6	End Term	Module 1,2,3,4	CO1,CO2, CO3, CO4	3 Hours	100	50%	AS per COE timetable

ASSESSMENT DETAILS FOR LABORATORY COMPONENT:

Sl. No	Assessment type	Contents	Course outcome Number	Duration in Hours	Marks	Weightage	Venue, Date and Time
1	Lab Assessment – 1	Module 1	CO1 & CO2	100 Min	4	5%	Regular Lab
2	Lab Assessment – 2			100 Min	4		
3	Lab Assessment – 3			100 Min	4		
4	Lab Assessment – 4			100 Min	4		
5	Lab Assessment – 5	Module 2	CO2	100 Min	4		
6	Lab Assessment – 6			100 Min	4		

7	Lab Assessment – 7			100 Min	4		Regular Lab
8	Lab Assessment – 8			100 Min	4		
9	Lab Assessment – 7	Module 3	CO3	100 Min	4		Regular Lab
10	Lab Assessment – 8			100 Min	4		
11	Lab Assessment – 9	Module 4	CO4	100 Min	5		Regular Lab
12	Lab Assessment - 10			100 Min	5		
11	Record Writing	All Modules	CO1-CO4	NA	10	5%	CAMU

COURSE CLEARANCE CRITERIA:

1. Students are required to have minimum of 75**%** of attendance to be eligible to attend exam, *Sec 7: Academic Regulations 2017*
2. Minimum performance criteria, *Sec 8.5-8.8: Academic Regulations 2017*
   Total: MID Term)Weightage - 25% Marks - 50(and FAT)Weightage - 50% Marks - 100(is for 75%. Minimum of 30%, i.e., 45/150 marks.

   Minimum of 40% of the grand total)200 marks( )or(F-Grade limit under relative grading, whichever is lower i.e., 80/200 marks
   The student should meet both above criteria to be exempted from Fail grade i.e., "F" grade. In case of "F" grade, the student has to re-register for the course.

Method of Assessment for Courses with Credit Structure (L –P – T)			
Components of Continuous Assessments		**Weightage (% of Total Marks)**	**Duration of Assessment**
	Mid term exam	25%	2 hour
	This Component of continuous assessment shall consist of at least TWO (02) of the following: (1) Surprise Test(s) (2) Quiz (3) Attendance / Class Participation (4) Assessment on self-learning topic(s), or (5) Any other type of assessment as prescribed in the concerned Course Handout.	25%	1 hour 30 minutes
	End Term Final Examinations	50%	3 hours
Total		**100%**	

CONTACT TIMINGS IN THE CHAMBER FOR ANY DISCUSSIONS: (Here mention the fixed slots on any of the week days for students to come and interact with you)

Students are encouraged to come for any discussions on this course during the Library, CCH Period, Monday from 3.00pm to 4.45pm for course consultation.

SAMPLE THOUGHT PROVOKING QUESTIONS:

TABLE 7: SAMPLE THOUGHT PROVOKING QUESTIONS				
SL NO	**QUESTION**	**MARKS**	**COURSE OUTCOME NO.**	**BLOOM'S LEVEL**
1	Mr. X is having sports shop. He had one container to place the set of balls. The maximum number of balls he can place in the container is 10. Whenever he thought balls are sold out he will buy the various color balls and filling the container by giving number on the ball. He insists his assistant to sell the top ball in the container. Mr. X want to know the count of each color ball and print which color contains more balls.	10	CO1	RECALL
2	An event manager, Mr. Tasa, permits a family of 3 or more people to event of a fest. He will call the family member to counter1. They can	10	CO2	APPLY

	come in any order of their choice. Mr. Tasa, makes note of the first character in their name and stores them as a pile one top of another. The family members are called counter2 in the reverse order as that of counter1 and the first character of their names are stored as a pile one top of another. Mr. Tasa compares the data from the counter2. If they are of the same family is eligible to participate in the event else, they must choose another event.			

TARGET SET FOR COURSE OUTCOME ATTAINMENT:

Sl.no	CO No.	Course Outcomes	Target set for attainment in percentage
01	CO1	Implement program for given problems using fundamentals of data structures.]Application[	65%
02	CO2	Apply an appropriate linear data structure for a given scenarios.]Application[	60%
03	CO3	Apply an appropriate non-linear data structure for a given scenarios.]Application[	60%
04	CO4	Explain the performance analysis of given searching and sorting algorithms.]Comprehension[	60%

Signature of the course Instructor

This course has been duly verified Approved by the D.A.C.

Signature of the Chairperson D.A.C.

COURSE COMPLETION REMARKS & SELF ASSESSMENT:

Sl. No.	Activity as listed in the Course Schedule	Scheduled Completion Date	Actual Completion Date	Remarks
1	Module**:** 01			
2	Discussion of MID TERM Paper			
3	Evaluation **–** 1 **(**Mid term exam)			
4	Module**:** 02			
5	Module**:** 03			
6	Evaluation **–** 2 **(**Lab CA)			
7	Module**:** 04			
8	Evaluation **–** 3 **(**End term exam**)**			

COURSE SCHEDULE FOR LABORATORY COMPONENT:

Sl. No.	Activity As listed in the course Schedule	Scheduled Completion Date	Actual Completion Date	Remarks
01	Lab Sheet – 1			8
02	Lab Sheet – 2			8
03	Mid Term Theory Exam	As per COE		
04	Lab Sheet – 3			6
05	Lab Sheet – 4			6
06	Last Instruction Day	22**.**12**.**2023		

Any specific suggestion/Observations on content/coverage/pedagogical methods used etc.:

COURSE OUTCOME ATTAINMENT:

TABLE 8: TARGET SET FOR ATTAINMENT OF EACH CO and ATTAINMENT ANALYSIS AFTER RESULTS						
Sl.no	**C.O. No.**	**Course Outcomes**	**Threshold Set for the CO**	**Target set for attainment in percentage**	Actual C.O. Attainment In Percentage *	Remarks on attainment &Measures to enhance the attainment *
01	CO1	Implement program for given problems using fundamentals of data structures.	60	65%		
02	CO2	Apply an appropriate linear data structure for a given scenarios.	55	60%		
03	CO3	Apply an appropriate non-linear data structure for a given scenarios.	55	60%		
04	CO4	Explain the performance analysis of given searching and sorting algorithms.	60	60%		

Name and signature of the Faculty member:

D.A.C. observation and approval