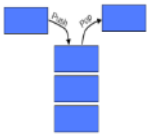
Government of Karnataka
Department of Technical Education
Bengaluru

	Course Title: **Data Structures lab**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15CS45P**
	Type of Course: **Tutorial and Practical's**	Credit **:03**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites

Knowledge of programming language.

Course Objectives

Design and Develop programs on derived data types and data structures such as stack, queue, linked list, sorting and searching.

Course Outcome

On successful completion of the course, the students will be able to attain CO:

Course Outcome		Experiment linked	CL	Linked PO	Teaching Hrs
CO1	Demonstrate the concepts of pointers	***1 to 5***	***U***	2,3,4,8,10	**15**
CO2	Design programs based on the concepts of structures and files.	***6 to 9***	***U/A***	2,3,4,8,10	**12**
CO3	Demonstrate the concepts of Stack, Queue and Linked List and apply various operations on them.	***10 to 15***	***U/A***	2,3,4,8,10	**21**
CO4	Demonstrate the concept of binary tree traversal and its operations.	***16***	***U/A***	2,3,4,8,10	**06**
CO5	Design programs based on the concept of sorting and searching techniques.	***17 to 20***	***U/A***	2,3,4,8,10	**24**
			Total sessions		**78**

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Data Structures lab	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**-**	**3**

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

List of Graded Practical Exercises

Sl. No	PART – A
1	Write a C program to illustrate the use of pointers in arithmetic operations.
2	Write a C program to swap two numbers using Call by value and Call by reference parameter passing techniques.
3	Write a C program to find the smallest element in an array of 10 elements using pointers.
4	Write a C program to create a dynamic array of integers using pointers.
5	Write a C program to illustrate the use of function pointer.
6	Write a C program to count the number of characters in a given file.
7	Write a C program to create a file that contains at least 5 records which consists of Book No., Book Name, Author, Publisher, and price.
8	Write a C program to display the contents of the file created in program No. 5 in the following format **Book No. Book Name Author Publisher Price**
9	Write a C program to copy one file to another file using command line arguments.
Sl. No	**PART – B**
10	Write a C program to implement singly linked list: insert, delete, search and display.
11	Write a C program to illustrate Stack operations using arrays.
12	Write a C program to find the GCD of two numbers using recursion
13	Write a C program to evaluate a POSTFIX expression using stack operations.
14	Write a C program to implement queue using arrays.
15	Write a C program to implement queue using linked list.
16	Write a C program to implement binary tree traversal operations.
17	Write a C program to sort an array using bubble sort
18	Write a C program to sort an array using selection sort.
19	Write a C program to search a given number using linear search.
20	Write a C program to search a given number using binary search.

Reference

1. Data Structures using C by E. Balaguruswamy - Tata McGraw-Hill Education
2. Data Structures using C by Aaron M Tenenbaum - Pearson Education India

Suggested list of student activities

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

1. Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and programme coordinator.
2. Each group should conduct different activity and no repeating should occur

1	Conduct a survey on various uses of pointers and submit a report of 2 pages.
1	Conduct a survey on the real time applications of Stacks and Queues and submit a report of 3 to 4 pages.
2	Conduct a survey on the real time applications of Linked Lists and Trees and submit a report of 3 to 4 pages.
3	Compare C structures and Java Classes and submit a report.
4	Quiz, Presentation and Seminars

Course Delivery

The course will be delivered through Demonstration and Practices

Course Assessment and Evaluation Scheme

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE (Continuous Internal Evaluation)	IA	Students	Twice tests (average of two tests)	10	Blue books	1 to 5
				Record and	10	Record	1 to 5
				Student activity	05	Report.	
				Total	**25**		
	SEE (Semester End Examination)	End Exam		**End of the course**	**50**	Answer scripts at BTE	1 to 5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1 to 5 Effectiveness of Delivery of instructions & Assessment Methods

***CIE** – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note:

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	Bloom's Category	%
1	Remembrance	10
2	Understanding	30
3	Application	60

Note to IA verifier: ***The following documents to be verified by CIE verifier at the end of semester***

1. Blue Book(10 marks)
2. Record (10 marks)
3. Student suggested activities report for 5 marks
4. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Format for Student Activity Assessment

DIMENSION	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Score
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collects some basic information; refer to the topic	Collects relevant information; concerned to the topic	Collects a great deal of information; all refer to the topic	3
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs all duties	Performs all duties of assigned team roles with presentation	4
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Does the assigned job without having to be reminded.	Always does the assigned work without having to be reminded and on given time frame	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Listens, but sometimes talk too much	Listens and contributes to the relevant topic	Listens and contributes precisely to the relevant topic and exhibit leadership qualities	3
					TOTAL	**13/4=3.25=4**

All student activities should be done in a group of 4-5 students with a team leader.

Scheme of Valuation for End Examination

1	Writing one program from PART-A and one program from PART-B	10+10=20
2	Executing any one program with result	20
3	Viva	10
	Total	**50**

***Evaluation should be based on the screen output only. No hard copy required.*

***Change of question is allowed only once. Marks of 05 should be deducted in the given question.*

Resource requirements for Data Structures Lab

(For an Intake of 60 Students [3 Batches])

Sl. No.	Equipment	Quantity
1	PC systems (latest configurations with speakers)	20
2	Laser Printers	01
3	Networking (Structured) with CAT 6e / wireless 24 Port switches / Wireless Router I/O Boxes for networking(as required)	03
4	Broad Band Connection	01

***Open Source Software should be encouraged*

MODEL QUESTION BANK

Sl. No	PART – A
1	Write a C program to illustrate the use of pointers in arithmetic operations.
2	Write a C program to swap two numbers using Call by value and Call by reference parameter passing techniques.
3	Write a C program to find the smallest element in an array of 10 elements using pointers.
4	Write a C program to create a dynamic array of integers using pointers.
5	Write a C program to illustrate the use of function pointer.
6	Write a C program to count the number of characters in a given file.
7	Write a C program to create a file that contains at least 5 records which consists of Book No., Book Name, Author, Publisher, and price.
8	Write a C program to display the contents of the file created in program No. 5 in the following format **Book No. Book Name Author Publisher Price**
9	Write a C program to copy one file to another file using command line arguments.
Sl. No	**PART – B**
10	Write a C program to implement singly linked list: insert, delete, search and display.
11	Write a C program to illustrate Stack operations using arrays.
12	Write a C program to find the GCD of two numbers using recursion
13	Write a C program to evaluate a POSTFIX expression using stack operations.
14	Write a C program to implement queue using arrays.
15	Write a C program to implement queue using linked list.
16	Write a C program to implement binary tree traversal operations.
17	Write a C program to sort an array using bubble sort
18	Write a C program to sort an array using selection sort.
19	Write a C program to search a given number using linear search.
20	Write a C program to search a given number using binary search.