Course Plan

A. Course Handout updated on 27th June, 2023

Institute/School Name	Chitkara University Institute of Engineering and Technology		
Department Name	Computer Science & Engineering		
Programme Name	Bachelor of Engineering, Computer Science & Engineering		
Course Name	Programming Abstractions	Session	2023-2024
Course Code	CS179	Semester/Batch	5th/2021
L-T-P (Per Week)	8-0-0	Course Credits	04
Course Coordinator	Dr. Tejinder Kaur		

1. Objectives of the Course

The course provides a wide scope of learning & understanding of the subject and the main objectives of the course are:

- To make students ready for the programming jobs in software-product based companies.
- Strong problem-solving skills and computer science fundamentals.
- Identify importance of object-oriented programming and difference between structured oriented and object-oriented programming features.
- Exercise and reinforce prior programming knowledge to effectively code standard problems and algorithms with optimized complexity.

2. Course Learning Outcomes

After completion of the course, students will be able to do the following:

CO1: Understand the basic concept of object-oriented programming such as array, polymorphism, encapsulation etc.

CO2: Exemplify the concept of data structure and able to identify appropriate data structure while designing the algorithms.

CO3: Implement a well-structured, robust computer program.

CO4: Analysis the concept of Bit Masking, recursion and dynamic programming to implement it on real time applications.

CO5: Reviewing the concept of backtracking and object-oriented dynamic programming to implement on software based real time applications.

CO-PO Mapping Grid

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2		H	H	H	H						M	
CO3			H	H								
CO4		H	H					H	M	M		
CO5		H	H	M		M		H				H

3. Recommended Books (Reference Books/Text Books):

RB1: Object Oriented Programming with C++ by E Balagurusamy, 2001, Tata McGraw-Hill.

RB2: Object Oriented Programming in Turbo C++ by Robert Lafore, 1994, The WAITE Group Press.

RB3: Complete Reference C++, Herbert Schlitz, TMH.

RB4: Cracking the Coding interviews 6th edition by Gayle Laakmann McDowell

RB5: Java: The Complete Reference by Herbert Schildt, 9th Edition, Oracle Press and McGraw Hill Publishers.

RB6: Data Structures and Algorithms Made Easy by Narasimha Karumanchi

RB7: DATA STRUCTURES AND ABSTRACTIONS WITH JAVA, 5TH EDITION, Frank Carrano, Timothy Henry, Pearson Publications.
RB8: Programming Abstractions in C by Eric S. Roberts 1stEdition, Pearson Publication
RB9: Data Structures using Java by Robert Lafaore, 2nd Edition, Sams Publishing, ISBN13: 978-0672324536

4. Other readings and relevant websites:

S. No.	Links of Journals, Magazines, websites and Research Papers
1	https://www.tutorialspoint.com/java/java_quick_guide.htm
2	https://thecleverprogrammer.com/2020/10/25/the-fundamentals-of-c-programming-language/?msclkid=333199a8bece11ec8c83bf5534909d32
3	https://www.javatpoint.com/cpp-array-of-pointers?msclkid=966ad51dbece11ec949a8b0b78205a7d
4	https://www.w3schools.com/cpp/default.asp
5	https://www.programiz.com/cpp-programming/variables-literals
6	https://www.geeksforgeeks.org/array-data-structure/?ref=shm
7	https://www.geeksforgeeks.org/bitmasking-and-dynamic-programming-set-1-count-ways-to-assign-unique-cap-to-every-person/
8	https://www.geeksforgeeks.org/recursion-practice-problems-solutions/
9	https://www.youtube.com/watch?v=IJDJ0kBx2LM
10	https://www.simplilearn.com/tutorials/data-structure-tutorial/backtracking-algorithm
11	https://towardsdatascience.com/space-and-time-complexity-in-computer-algorithms-a7fffe9e4683?gi=287c4af61600
12	https://www.educative.io/blog/object-oriented-programming
13	https://medium.datadriveninvestor.com/mastering-object-oriented-programming-in-c-672773d87388
14	https://www.codesdope.com/cpp-virtual-and-abstract/
15	https://www.studytonight.com/cpp/abstract-class-and-pure-virtual.php
16	http://www.nou.ac.in/Online%20Resourses/01-09/bca5.pdf
17	http://www.btechsmartclass.com/data_structures/stack-using-linked-list.html
18	https://iq.opengenus.org/implement-stack-using-array-and-linked-list/
19	https://coderbyte.com/algorithm/implement-queue-using-two-stacks
20	https://www.programiz.com/dsa/deque
21	https://opendsa-server.cs.vt.edu/ODSA/Books/CS3/html/StackLinked.html#:~:text=Linked%20Stack%20Implementation,of%20zero%20or%20one%20elements.
22	https://enos.itcollege.ee/~jpoial/allalaadimised/reading/Java-Abstraction.pdf
23	https://www.e-booksdirectory.com/details.php?ebook=10953
24	https://inst.eecs.berkeley.edu/~cs61a/su12/lec/notes/data.html
25	https://cs.stanford.edu/people/eroberts/books/ProgrammingAbstractionsInJava/index.html
26	https://www.youtube.com/watch?v=oBt53YbR9Kk
27	https://www.mathsisfun.com/games/towerofhanoi.html
28	https://prepinsta.com/c-program/implementation-of-queues-using-linked-list/

5. Recommended Tools and Platforms

C++Builder, Visual Studio Code, GCC Compiler, Eclipse, J2EE, vlab.

6. Course Plan:

Lecture Number	Topics	Recommended Book / Other reading material
1 – 3	Revision - Java	Link 1, RB5
4 – 7	Arrays - Algorithms such as Linear Search, Binary Search, Sorting, Maximum Subarrays, and Searching	Link 2, RB7
8 – 12	Strings - String Class and its useful methods. Concept of immutability, memory diagram, intern pool, use of new keyword in generating strings.	Link 3, RB6

	Problem solving in which various problems will be covered using String	
13 - 15	Bit masking - In this section, we will understand how Bitwise operators like AND, OR, XOR, and NOT to work on machine code to help write the programs that works faster, since computer understands machine code. This concept is also very useful in Recursion as well as Dynamic programming advanced concepts.	Link 4, RB8
16 – 18	Recursion, Need of recursion, with examples problems.	Link 5, GFG, RB4
ST-I (Syllabus covered from 1-18 lectures)		
19 – 21	Deep Dive into Recursion – More complex recursive applications using arrays and strings.	Link 6, RB6
22 – 25	Backtracking and its applications	Link 10, RB6
26 – 30	Time and Space Complexities – Concept and Calculations along with special emphasis on Algorithms and data structures studies thus far.	Link 8, RB4, RB8
31 – 36	Data Structures and OOPS – Types and Examples of Data structures with their programming abstractions in context with typical concepts of Object-Oriented Paradigm	Link 12, RB1, RB9
37 – 40	OOPS – Encapsulation, Inheritance, Virtual base class, Overriding member functions	Link 13, RB2, RB9
41 – 44	Virtual Functions and Polymorphism: Concept of Binding - Early binding and late binding	Link 14, RB1, RB2
45 – 48	Virtual functions, Pure virtual functions, Abstract classes	Link 15, RB1, RB2
49 – 50	Exception Handling, Templates and Generic Programming	Link 16, RB1, RB2
51 – 55	Linked List – types, implementation, examples and applications with in-context Programming abstractions.	Link 17, RB9, Javatpoint
56 – 60	Stack and its operations with Hands-on implementation of its applications.	Link 18, Programiz
61 – 66	Some typical problems using Stack such as Histogram Area, Stock Span, andBalanced Parentheses etc.	Link 19, GFG, HackerRank
67 – 70	Stacks implementation using Arrays, Linked Stacks	Link 17 to Link 20, GFG
ST-II (Syllabus covered from 19-70 lectures)		
71 – 78	2 stacks in an Array, k stacks in an array, Tower of Hanoi, Queues implementation using Arrays, Linked Queues	Link 18, Link 19, Link 27, Link 28, RB4
79 – 86	Circular Queues, Implement Queue using Stacks, Dequeues	Link 19, Link 20, RB6
87 – 90	Revision and Queries Doubt Clearance window, Out of the Box stuff along with Beyond Curricula Topics such as Dynamic Programming.	Link 26, RB4, RB6
ETE (Syllabus covered from 1-90 lectures)		

7. Delivery/Instructional Resources

Lecture Number	**Topics**	**PPT** *(link of ppts on the central server)*	**Industry Expert Session** *(If **yes**: link of ppts on the central server)*	**Web References**	**Audio-Video**
1 – 3	Revision - Java	https://cs.calvin.edu/activities/books/java/intro/1e/PPSlid			

		es/chap02.ppt			
4 – 7	Arrays - Algorithms such as Linear Search, Binary Search, Sorting, Maximum Subarrays, and Searching	https://cse.iitkgp.ac.in/~bivasm/pds_notes/search_sort_v1.ppt	https://personal.utdallas.edu/~daescu/max-subarray.pptx	https://www2.cs.uh.edu/~rizk/cosc2430/slides/07-sort-99-intro.ppt	
8 – 12	Strings - String Class and its useful methods. Concept of immutability, memory diagram, intern pool, use of new keyword in generating strings. Problem solving in which various problems will be covered using String	http://www.cs.nthu.edu.tw/~d9662827/cs340100_97/11_String.ppt	https://courses.cs.washington.edu/courses/cse331/11sp/lectures/slides/07-mutation.ppt		
13 - 15	Bit masking - In this section, we will understand how Bitwise operators like AND, OR, XOR, and NOT to work on machine code to help write the programs that works faster, since computer understands machine code. This concept is also very useful in Recursion as well as Dynamic programming advanced concepts.	https://www.scribd.com/document/420973335/Lecture-01-Bitmasking			
16 – 18	Recursion, Need of recursion, with examples problems.	https://www.cse.unr.edu/~bebis/CS308/PowerPoint/Recursion.ppt	https://cs.fit.edu/~pkc/classes/cse1001/slides/ch11.ppt		
19 – 21	Deep Dive into Recursion – More complex recursive applications using arrays and strings.	https://people.cs.umass.edu/~moss/187/lectures/lecture-h-recursion.ppt			
22 – 25	Backtracking and its applications	https://courses.cs.washington.edu/courses/cse373/15su/lectures/lecture22.pptx			
26 – 30	Time and Space Complexities – Concept and Calculations along with special emphasis on Algorithms and data structures studies thus far.	https://sites.cs.ucsb.edu/~suri/cs130a/intro-1.ppt	https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf		
31 – 36	Data Structures and OOPS – Types and Examples of Data structures with their	https://iare.ac.in/sites/defaul	https://www.cet.edu.in/noticefiles/2		

	programming abstractions in context with typical concepts of Object-Oriented Paradigm	t/files/PPT/JAVA-PPT'S.pdf	85_OOPS%20lecture%20notes%20Complete.pdf		
37 – 40	OOPS – Encapsulation, Inheritance, Virtual base class, Overriding member functions	https://cs.slu.edu/~chambers/spring17/3200/schedule/chapter9.ppt			
41 – 44	Virtual Functions and Polymorphism: Concept of Binding - Early binding and late binding,	http://web.cse.ohio-state.edu/~soundarajan.1/courses/45922/WeiDu/lecture7.ppt	https://ecs.syr.edu/faculty/fawcett/Handouts/cse775/Presentations/latebinding.ppt		
45 – 48	Virtual functions, Pure virtual functions, Abstract classes	https://courses.cs.washington.edu/courses/cse374/21au/lectures/lecture23.pptx	https://www.cs.ccu.edu.tw/~naiwei/cs2160/chap15cpp3rd.ppt		
49 – 50	Exception Handling, Templates and Generic Programming		https://techiefood4u.files.wordpress.com/2018/10/unit_4_v_3-2.pptx		
51 – 55	Linked List – types, implementation, examples and applications with in-context Programming abstractions.	https://cse.iitkgp.ac.in/pds/semester/2016a/JM/Wk11-linkedlist.ppt			
56 – 60	Stack and its operations with Hands-on implementation of its applications.	https://www.cs.utexas.edu/~scottm/cs307/handouts/Slides/Topic15Stacks.ppt			
61 – 66	Some typical problems using Stack such as Histogram Area, Stock Span, andBalanced Parantheses etc.			https://www.geeksforgeeks.org/applications-advantages-and-disadvantages-of-stack/	
67 – 70	Stacks implementation using Arrays, Linked Stacks	https://www.cs.bu.edu/fac/gkollios/cs113/Slides/LinkedS			

		Q.ppt			
71 – 78	2 stacks in a Array, k stacks in an array, Tower of Hanoi, Queues implementation using Arrays, Linked Queues	https://cse.iitkgp.ac.in/pds/semester/2017s/DSM/resources/slides/13%20Stacks%20and%20Queues.pptx		https://www.codingninjas.com/studio/library/two-stacks-in-an-array	
79 – 86	Circular Queues, Implement Queue using Stacks, Dequeues	https://courses.cs.washington.edu/courses/cse373/12sp/lectures/03-28-queues/02-queues.ppt	https://www.cse.iitd.ac.in/~mohanty/col106/Resources/Week2-stacks-queues.pptx		
87 – 90	Revision and Queries Doubt Clearance window, Out of the Box stuff along with Beyond Curricula.	https://www2.cs.sfu.ca/~binay/2018/409/DynamicProgramming.pptx			

8. Action plan for different types of learners

Slow Learners	Average Learners	Advanced Learners
• Remedial Class for slow learners to revise specific topics. • Individual feedback of each slow learner.	• Doubt Class for average learners • Doubts of individual student will be resolved.	• Certification exams will be offered to interested students.

9. Evaluation Scheme & Components:

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment
Component 2	Subjective Test/Sessional Tests (STs)	02*	40%	Offline
Component 3	End Term Examinations	01	60%	Offline
Total		**100%**		

*Out of 2 STs, the ERP system automatically picks the best 1 ST marks for evaluation of the STs as final marks.

10. Details of Evaluation Components:

Evaluation Component	Description	Syllabus Covered (%)	Timeline of Examination	Weightage (%)
Component 2	ST 01	Up to 20%	4th Week	40%
	ST 02	21% - 80%	10th Week	
Component 3	End Term Examination*	100%	12th Week	60%
Total				100%

*As per Academic Guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination.

11. Syllabus of the Course:

Lecture Number	Topics	No. of Lectures	Weightage %
1 – 3	Revision - Java	3	20 %
4 – 7	Arrays - Algorithms such as Linear Search, Binary Search, Sorting, Maximum Subarrays, and Searching	4	
8– 12	Strings - String Class and its useful methods. Concept of immutability, memory diagram, intern pool, use of new keyword in generating strings. Problem solving in which various problems will be covered using String	4	
13 - 15	Bit Masking - In this section, we will understand how Bitwise operators like AND, OR, XOR, and NOT to work on machine code to help write the programs that works faster, since computer understands machine code. This concept is also very useful in Recursion as well as Dynamic programming advanced concepts.	4	
16 – 18	Recursion, Need of recursion, with examples problems.	3	
19 – 21	Deep Dive into Recursion – More complex recursive applications using arrays and strings.	3	25 %
22 – 25	Backtracking and its applications	4	
26 – 30	Time and Space Complexities – Concept and Calculations along with special emphasis on Algorithms and data structures studies thus far.	5	
31 – 36	Data Structures and OOPS – Types and Examples of Data structures with their programming abstractions in context with typical concepts of Object-Oriented Paradigm	6	
37 – 40	OOPS – Encapsulation, Inheritance, Virtual base class, Overriding member functions	4	
41 – 44	Virtual Functions and Polymorphism: Concept of Binding - Early binding and late binding,	4	25 %
45 – 48	Virtual functions, Pure virtual functions, Abstract classes	4	
49 – 50	Exception Handling, Templates and Generic Programming	2	
51 – 55	Linked List – types, implementation, examples and applications with in-context Programming abstractions.	5	
56 – 60	Stack and its operations with Hands-on implementation of its applications.	5	
61 – 66	Some typical problems using Stack such as Histogram Area, Stock Span, andBalanced Parentheses etc.	5	30 %
67 – 70	Stacks implementation using Arrays, Linked Stacks	5	
71 – 78	2 stacks in a Array, k stacks in an array, Tower of Hanoi, Queues implementation using Arrays, Linked Queues	8	
79 – 86	Circular Queues, Implement Queue using Stacks, Dequeues	8	
87 – 90	Revision and Queries Doubt Clearance window, Out of the Box stuff along with Beyond Curricula.	4	

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Dr. Tejinder Kaur	
Head Academic Delivery	Dr. Susheela Hooda	
Dean 3rd Year	Dr. Rupali Gill	
Date (DD/MM/YYYY)	27/06/2023	