


Course Number:	Course Name: Seminar/Case Studies	 BML MUNJAL UNIVERSITY <small>FROM HERE TO THE WORLD</small>
Credits: 3 (3-0-0)	Contact hours per week = 2 hours	
Instructor-in-charge: Dr. Kiran Khatter	Email: kiran.khatter@bmu.edu.in	

Aim of the course: The main objective of this course is to introduce students to different data structures and illustrate their effective use in solving technical and logical problems. The course comprehensively explores different problem-solving techniques and skills. Proficiency in problem-solving skills is a fundamental expectation for any competent developer, as these concepts are commonly assessed by reputable companies during the screening process for software developer positions.

Course Overview and Context: - The primary emphasis will be on achieving a deep understanding of data structures, their implementation, practical applications through problem-solving scenarios, exploring various programming paradigms, algorithm analysis, and the practical application of different data structures and algorithms. This course explores the fundamental workings of algorithms and data structures, which lie at its core essence.

Topics of the Course

Linear Search, Maximum in an Array, Sorting(Selection, Bubble and Insertion), Binary search ,Kadane's Algo- $O(N)$, Merge two sorted arrays, Rotate Array anti clock wise by k times ,Unique Number-1, and tell about bitwise operators , Basics of strings, String methods, String builder, Mutable and Immutable concepts, 2D Arrays: Wave Print, Spiral Print, and Transpose .

Recursion :Factorial, Fibonacci, isArraySorted, SumofArray, Print Numbers – 1) Increasing Order 2) Decreasing Order, MergeSort, Subsequence, Rat in Maze, N_Stairs, Subset Sum.

Stack :stack implementation Queue implementation , LinkedList implementation(Add and Delete), Mid (Cycle detection hints) Reverse LinkedList ,Merge two Sorted LinkedList, Intersection of two LinkedList, Binary Tree implementation and traversal of binary tree(PreOrder , InOrder and PostOrder), Diameter- $O(N^2)$ and $O(N)$ height , count number of node, Level-Order , Create Tree using Pre and Inorder, Create Tree using level-order, Binary Search Tree implementation , Addition and Deletion,

BST to LinkedList, Balanced binary Tree, Valid BST, priority queue Collections , Kth Smallest, Meeting Room-2 Merge k Sorted List, Map and Set Collections(HashMap TreeMap and LinkedHashMap) SubArray using Map related Question,

Dynamic Programming:- Fib, min Steps to one, coin Changes, ,LCS, LIS, knapsack Edit Distance, Graph basic , BFS, DFS,Dijkstra, MST(Prims) bipartite.

CO PO Mapping

Three Levels of Mapping: 1: means weak, 2: means medium, and 3: means strong.

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	POS4
CO1	3	3	2	2	2											
CO2		2	3	2				2								
CO3		3	3		3							2				

Session Plan:

Competency	CO	No of sessions
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Introduction for High Level Language (Java), Arrays 2D ,String, Sorting Algorithms.	C01	5 sessions
Recursion and Backtracking and Problem Solving related to Recursion and backtracking.	C01, C02, C03	8 sessions
LinkedList and Problems related LinkedList	C01, C02, C03	2 sessions
Stack ,Queue and DeQueue and Problems related Stack and Queue	C01, C02	4 sessions
Binary Tree, BST and Problem related Trees	C02, C03	3 sessions
Dynamic Programming and Problems related to DP	C01, C02	4 sessions
Hashmap,Heap and Graph	C02, C03	5 sessions

32 sessions

Learning Resources:

Books:

- Cracking the Coding Interview author([Gayle Laakmann McDowell](#))
- Coding Interview Questions author([Narasimha Karumanchi](#)).

MOOCs

1. [Data Structures and Algorithms Specialization](#)
2. [NPTEL Data Structures And Algorithms, IIT Delhi.](#)

Experiential Learning Component:

In this course, students attempt to develop a practical application to address real world problem by proposing novel improvements to an existing method, applying existing methods to different types of problems. The students are also expected to implement and show the results of the proposed solution or attempt to reimplement and improve on a research paper on a topic of their choice. Students can also integrate methods/techniques of other courses such as Digital Image Processing, Artificial Intelligence, etc. A separate examination will be conducted to evaluate the solution provided by each student in such cases. This attempts to provide the following skills:

- Thinking critically to deal with uncertainty and ambiguity.
- Application of for handling real-world problems.
- skills in writing technical concepts in the form of research papers.

Assessment Pattern: The final grade will be based on the marks/ grades obtained in the mid-semester and end-semester evaluation and other assessments defined in the assessment table. The relative grading method described in the university's academic regulations will be followed to grade the students. The student must secure a minimum of 40% of marks after completing all the assessments in the following table to become eligible for grading.

Component	Duration	Weightage (%)	Evaluation Week	Remarks
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Class Participation (Experiential Learning)	--	10%	Continuous	- the level of participation - Based on discussion
Project Phase Evaluation -1 (Experiential Learning)	--	20% (5% each)	Continuous	Formulation of a problem, conducting feasibility, writing a project proposal, implementation
Quiz/Assignment	60 Mins	30%	Week 8	Subjective/Coding based
End Term Evaluation (Project)	20-30 Mins (Per student)	40%	As per date-sheet	Project-Based (Panel Evaluation)

Student Responsibilities:

- Attend lectures and do the work Lab Assignments as per instructions.
- Prepare for discussions on the analysis part of Lab Assignments during class every week.

Attendance Policy: Students are expected to attend classes regularly. Failure to follow the classes regularly and adhere to the expected attendance percentage will result in losing quiz/lab marks and a reduction of the grade as per the University's grading policy.

Recourse examination policy: As per University policy.

Make-up policy: No make-up work will be given for unexcused absences. The faculty needs to be informed in advance if the student is going to miss submitting an assignment or taking any evolution component. It is at the discretion of the faculty to sanction make-up for an evaluation component.

Behavior expectations: No mobile phones and other distractive gadgets are permitted in the class. Laptops are allowed during the defined course for assignment only.

Academic dishonesty/cheating/plagiarism: Plagiarism and dishonesty in any form in any evaluation component will lead to appropriate disciplinary action.