



National Computing Education Accreditation Council NCEAC



NCEAC.DOC.001-E

COURSE DESCRIPTION

NAME OF INSTITUTION	Lahore Garrison University
PROGRAM (S) TO BE EVALUATED	Computer Science , Fall 2022

Course Description : Introduction; role of algorithms in computing, Analysis on nature of input and size of input Asymptotic notations; Big-O, Big Ω , Big Θ , little-o, little- ω , Sorting Algorithm analysis, loop invariants, Recursion and recurrence relations; Algorithm Design Techniques, Brute Force Approach, Divide-and-conquer approach; Merge, Quick Sort, Greedy approach; Dynamic programming; Elements of Dynamic Programming, Search trees; Heaps; Hashing; Graph algorithms, shortest paths, sparse graphs, String matching; Introduction to complexity classes;

Course Code	CSC354			
Course Title	Design & Analysis of Algorithms			
Credit Hours	3+0			
Prerequisites by Course(s) and Topics	Data Structures and Algorithms			
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	SESSIONAL (Quizzes, Assignments, Presentations) =25 % Midterm Exam =25 % Final Exam = 50%			
Course Coordinator	Sadia Kousar			
URL (if any)				
Current Catalog Description				
Textbook (or Laboratory Manual for Laboratory Courses)	Introduction to Algorithms (3rd edition) by Thomas H. Corman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein			
Reference Material	Algorithm Design, (1st edition, 2013/2014), Jon Kleinberg, Eva Tardos, 3. Algorithms, (4th edition, 2011), Robert Sedgewick, Kevin Wayne			
Course Goals	The course introduces students with the basic notions of the design of algorithms and the underlying data structures. Students will learn about several measures regarding the structure, complexity, and efficiency of algorithms.			
Course Learning Outcomes (CLOs):	At the end of the course the students will be able to:		Domain	BT Level*
	Apply common algorithmic techniques to standard computational problems		C	3
	Analyze computational complexity of common/standard algorithms		C	4
	Design new algorithms for different computational problems		C	5
	Construct proofs of correctness and time complexity of various algorithms		C	6
	* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain			

Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-hour lectures)

Week	Lecture	Topics Covered
Week 1	1	Ch 1 : Introduction: What Is an Algorithm? The place of algorithms in computer science and our everyday world, Designing Techniques, Model of Computation.
	2	What kinds of problems are solved by algorithms? Examples of Algorithms Ch 2 : Getting Started Insertion Sort , Analysis of Insertion Sort: Best Case Analysis Worst Case Analysis
Week 2	3	Merge Sort Description of Merge Sort Examples of Merge Sort
	4	Performance of Merge Sort Analysis of Merge Sort
Week 3	5	Ch : 3 Growth of Function Asymptotic Notations: Big Oh
	6	Big Theta, Big Omega, Standard Notations and common functions Ch : 4 Recurrences Master Method Examples of Master Method
Week 4	7	Recursion Tree Method Examples, Ch : 6 Heap Sort Introduction to Heaps
	8	Substitution Method & Examples
Week 5	9	Maintaining the heap property Max-Heapify Procedure Analysis of Max-Heapify Procedure
	10	Build a heap (Build Max-Heap procedure) Analysis of Build Max-Heap procedure The Heap-Sort Algorithm,
Week 6	11	Ch: 7 Quick Sort Description of Quick Sort Examples
	12	Performance of Quick Sort Analysis of Quick Sort
Week 7	13	Ch:8 Sorting in Linear Time Counting Sort Analysis of Counting Sort
	14	Radix Sort & Analysis, Bucket Sort & Analysis
Week 8	1 hours	Mid Term
Week 9	15	Ch : 15 Dynamic Programming Element of the dynamic programming
	16	Matrix Chain Multiplication
Week 10	17	Ch: 16 Greedy Algorithms Activity Selection Problem
	18	Element of the greedy strategy
Week 11	19	Greedy Vs Dynamic programming Knapsack Problem
	20	Huffman Trees and Codes
Week 12	21	Ch : 22 Elementary Graph Algorithms Representation of graph
	22	Breadth-First Search
Week 13	23	Ch : 23 Minimum Spanning Tree Growing a Minimum Spanning Tree
	24	Kruskal's Algorithm Example
Week 14	25	Prim's Algorithm Example
	26	Kruskal's Algorithm Example
Week 15	27	Ch : 24 Single-Source Shortest Paths
	28	Single-Source Shortest Paths in DAG Dijkstra's Algorithm
Week 16	29	Bellman-Ford Algorithm
	30	Floyd-Warshall Algorithm
Week 17	2 hours	Final Term

Laboratory Projects/Experiments Done in the Course	
Programming Assignments Done in the Course	

Instructor Name	Sadia Kousar
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Instructor Signature

Date
