

College of Computer Science and Information Systems
 Course Code : 474CSS-3
 Contact Hour : 3(0)

Department of Computer Science
 Algorithm Design and Analysis
 Prerequisite : 212CSS-3

Coordinator -

2. Course Description

This course introduces various algorithm design paradigms and the basics of computational complexity analysis using different models of computations with the overview of mathematical essentials, space and time complexities, asymptotic notations. Design and analysis of algorithms covers linear programming, greedy algorithms, divide-and-conquer, backtracking, branch-and-bound, search methods, graph algorithms and introduction to NP-Completeness.

3. Course Learning Outcomes

SL	By the end of this course, students should be able to:	Linkages to POs
1.	Describe important algorithmic problem types.	b(S)
2.	Measure the efficiency of algorithms by evaluating the time complexity of an algorithm using the asymptotic notation (Big-O), Omega(), Theta())	b(W),j(W)
3.	Analyze the expected performance of a particular algorithm in a particular context.	
4.	Utilize mathematical techniques to analyze the efficiency of an algorithm and demonstrate the algorithmic correctness.	j(S)
5.	Evaluate how to deal with problems for which no fast algorithms exist (NP Completeness)	a(W),j(W)

4. Learning Resources

Text	Anany Levitin, Introduction to the Design and Analysis of Algorithms, Second Edition, Pearson-Addison Wesley, ISBN 0-321-36413-9.
Reference	T.H. Cormen, C.H. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Second Edition, The MIT Press (ISBN 0-262-03293-7) & McGraw-Hill Book Company (ISBN 0-07-013151-1).
Reference	Jon Kleinberg and Eva Tardos, Algorithm Design, First Edition, Pearson-Addison Wesley, ISBN 0-321-29535-8
Reference	Horowitz, Sahni and Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications, ISBN 81-7515-257-5

5. Course Content : The list below provides a summary of the material that will be covered during the course

Week	Topics	References Book / Others Source	Special Event	Tutorial Activities	Lab Activities
1.	Fundamentals of algorithmic problem solving, important problem types and fundamental data structures	Ch-1: sec 1.1, 1.2 - 1.4	Reading Task: Ch-1: Page 19-23, Page 39,40	Ch-1: Ex. 1.4-3 (a) & (b)	
2.	Fundamentals of algorithmic problem solving, important problem types and fundamental data structures	Ch-1: sec 1.1, 1.2 - 1.4	Reading Task: Ch-1: Page 19-23, Page 39,40	Ch-1: Ex. 1.4-3 (a) & (b)	
3.	Asymptotic notations and mathematical analysis	Chapter 2: sec 2.1, 2.2	Reading Task: "Standard notations and common functions", Ref. bo	Ex.2.1-1(a-d), 2.1-8, 2.1.-9, 2.1-10	
4.	Asymptotic notations and mathematical analysis	Chapter 2: sec 2.2	Quiz -1	Ch-3: Ex. 3.2-4,5	

5.	Asymptotic notations and mathematical analysis	Chapter 2: Examples	Reading Task: "Summary", textbook, Ch-3, P: 120,121	Ch-3: Ex. 3.4-4,5	
6.	Brute force	Chapter 3: sec 3.1, 3.2	Assignment-1: Ex. 2.2-1 & 2.2-5, Ex. 4.1-6, textbook	Ch-4: Ex. 4.1-5; Ex. 4.3-1(a,b,c)	
7.	Brute force (Cont.)	Chapter 3: sec 3.2 & 3.4	Midterm-1		
8.	Divide and conquer	Chapter 4: sec 4.1 & 4.3	Reading Task: "Binary search trees", Ref. book-1 Ch-12, P: 253-2	Ch-4: Ex. 4.4-4, 4.4-7.a	
9.	Divide and conquer (Cont.)	Chapter 4: sec 4.4 & 4.5	Quiz-2	Ch-9: Ex 9.1-7(a), Ex 9.2-1(a), 2	
10.	Dynamic Programming	Chapter 8: sec 8.1, 8.2	Chapter 8: sec 8.1, 8.2	Ex 9.3-2(a), 4, Ex 9.4-1&3	
11.	Greedy Algorithms	Chapter 9: sec 9.1, 9.2	Midterm-2	Review	
12.	NP-completeness and reducibility	Ch-11: sec 11.2 & 11.3	Reading Task: "Approximation Algorithms for NP-hard Problems", T	Review	
13.	Coping with the Limitations of Algorithm Power: Backtracking	Ch-12: sec 12.1	Reading Assignment: "Graphs: Basic Definitions, Applications , Con	Review	
14.	Coping with the Limitations of Algorithm Power: Branch and bound	Ch-12: sec 12.2	Review	Review	

6. Evaluation Scheme: The following list is the contribution of course components to the final grade for the course.	
Component	Weight (%)
Quizzes	10
Assignments	10
Midterm Exam 1	15
Midterm Exam 2	15
Final Exam	50
Total	100

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