

**NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA**  
**NH 66, Srinivas Nagar, Surathkal, Mangaluru, Karnataka 575025, India**



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**DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL**  
**Course Plan Odd Semester 2022**

<b>Faculty Incharge:</b>	Dr. Shrutilipi Bhattacharjee	<b>Year and Semester:</b>	Odd Semester 2022-23
<b>Course Code:</b>	IT300	<b>Course Name:</b>	Design and Analysis of Algorithms
<b>Core/ Elective/MLC:</b>	Program Core	<b>L-T-P:</b>	(3-0-2) 4
<b>Pre-requisites:</b>	Computer Programming, Data Structures and Algorithms, Advanced Data Structures and Algorithms	<b>Contact Hours:</b>	3 per week – Lecture 2 per week – Lab
<b>Type of Course: (Lecture/ Tutorial/ Seminar/ Project)</b>	Lecture and Lab	<b>Course Assessment Methods: (both continuous and semester-end assessment)</b>	20% Mid-sem Exam 40% End-sem Exam 10% Quiz 15% Assignments 15% Mini Project
<b>Course Description:</b> This course exposes students to the concept of models of computation, algorithm analysis and asymptotic notation, time and space complexity, average and worst-case analysis, lower bounds, amortized analysis, algorithm design techniques: recursion, branch-and-bound, divide and conquer, greedy, dynamic programming, randomization, applications of the above techniques to a variety of problems: stable matching, linear- time selection, integer, polynomial and matrix multiplications, Fast Fourier Transforms (FFT): FFT Algorithms, computing shortest paths and minimum spanning trees, etc., reductions and the theory of NP completeness, approximation algorithms.			
<b>Objectives:</b> The main objective of the course is to learn the basic concepts of database systems <b>Aim:</b> On completing this course, the students should have acquired the following capabilities: <b>Bloom's Taxonomy levels:</b> L1: Remembering, L2: Understanding, L3: Applying, L4: Analysing, L5: Evaluating L6: Creating			

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CO1 [L1, L2, L3]: To understand key concepts of algorithms, the basic and advanced building blocks, apply these concepts for different algorithm design techniques  
 CO2 [L4]: To analyse the space and time complexity of the different techniques  
 CO3[L5]: To evaluate the performance of the algorithms for variety of problems and applications  
 CO4 [L6]: To design, construct, appropriately apply different algorithms for problem solving, project implementations, and real applications

**Course Plan:**  
 (tentative)

Week 1	Overview of design and analysis of algorithms, concept of models of computation
Week 2	Framework for algorithms analysis
Week 3	Asymptotic notations, algorithm design techniques basics: time and space complexity, average and worst-case analysis, lower bounds, amortized analysis
Week 4	Algorithm design techniques: Divide-and-conquer
Week 5	
Week 6	Algorithm design techniques: Divide-and-conquer
Week 7	Algorithm design techniques: Greedy algorithms
Week 8	Algorithm design techniques: Greedy algorithms
Week 9	MidSem
Week 10	Dynamic Programming
Week 11	Dynamic Programming
Week 12	Huffman Coding and stable matching
Week 13	Randomization
Week 14	NP Completeness and reduction
Week 15	NP Completeness and reduction
Week 16	Approximation Algorithms
Week 17	Approximation Algorithms
Week 18	EndSem

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**Text Books and/or Reference Books:**

- Jon Kleinberg and Eva Tardos, Algorithm Design, 1st Edition, Pearson Education India, 2013.
- S Dasgupta, C Papadimitriou, U Vazirani, Algorithms, McGraw-Hill Education, 2006.
- T H Cormen, C E Leiserson, R L Rivest, C Stein, Introduction to Algorithms, 3rd Edition, PHI, 2010.
- Steven S Skiena, The Algorithm Design Manual, 2nd Edition, Springer-Verlag, 2nd Edition, 2013.
- Michael T. Goodrich and Roberto Tamassia. Algorithm Design, Wiley, 1st Edition, 2006.
- Horowitz and Sahni, Fundamentals of Computer Algorithms, Galgotia Publications, 2nd Edition, 2009.

**ASSESSING THE ATTAINMENT OF COURSE OUTCOMES (CO) FOR THE COURSE**  
**IT210 Data Structures and Algorithms**

**The Course Outcomes:**

CO1 [L1, L2, L3]: To understand key concepts of algorithms, the basic and advanced notions, apply these concepts for different algorithm design techniques

CO2 [L4]: To analyse the space and time complexity of the different techniques

CO3[L5]: To evaluate the performance of the algorithms for variety of problems and applications

CO4 [L6]: To design, construct, appropriately apply different algorithms for problem solving, project implementations, and real applications

**Evaluation:**

20% Mid-sem Exam

40% End-sem Exam

15% Quiz

15% Assignments

10% Mini Project

**Assessment CO Matrix:**

<i>Assessment Types</i>	<i>Course Outcomes (CO)</i>			
	<i>CO1</i>	<i>CO2</i>	<i>CO3</i>	<i>CO4</i>

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Mid-sem Exam					
End-sem Exam					
Quiz					
Assignments					
Mini Project					

Dr. Shrutilipi  
Bhattacharjee  
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Dr. Shrutilipi Bhattacharjee  
Course Instructor

Mr. Pragnesh Thaker  
Course Instructor