# SCHEME OF COURSE WORK

## Department of Computer Science and Engineering

Course Details:

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| COURSE TITLE | Design And Analysis Of Algorithms | | |
| COURSE CODE | 22CT1109 | L T P C | 3 0 0 3 |
| PROGRAM | B.TECH | | |
| SPECIALIZATION | CSE | | |
| SEMESTER | IV | | |
| PRE REQUISITES | Problem Solving Using C, Data Structures & Algorithms | | |
| COURSES TO WHICH IT IS A PRE REQUISITE | NA | | |

Course Outcomes (COs):

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| 1 | Analyze the asymptotic performance of algorithms. (L3) |
| 2 | Apply divide-and-conquer and greedy methods to solve various problems.(L3) |
| 3 | Solve various optimization problems by applying dynamic programming techniques.(L4) |
| 4 | Apply backtracking and branch and bound methods to solve various problems.(L3) |
| 5 | Compare P, NP, NP-Hard and NP-Complete problems, and explain approximation algorithms.(L3) |

**Program Outcomes (POs):**

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| 1 | Graduates will be able to apply the knowledge of mathematics, science, engineering fundamentals and principles of Computer Science & Engineering to solve complex problems in different domains. |
| 2 | Graduates can identify, formulate, study contemporary domain literature and analyze real life problems and make effective conclusions using the basic principles of science and engineering. |
| 3 | Graduates will be in a position to design solutions for Engineering problems requiring in depth knowledge of Computer Science and design system components and processes as per standards with emphasis on privacy, security, public health and safety. |
| 4 | Graduates will be able to conduct experiments, perform analysis and interpret data as per the prevailing research methods and to provide valid conclusions. |
| 5 | Graduates will be able to select and apply appropriate techniques and use modern software design and development tools. They will be able to predict and model complex engineering activities with the awareness of the practical limitations. |

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| 6 | Graduates will be able to carry out their professional practice in Computer Science & Engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities. |
| 7 | Graduates would understand the impact of the professional engineering solutions on environmental safety and legal issues. |
| 8 | Graduates will transform into responsible citizens by adhering to professional ethics. |
| 9 | Graduates will be able to function effectively in a large team of multidisciplinary streams consisting of persons of diverse cultures without forgetting the significance of each individual's contribution. |
| 10 | Graduates will be able to communicate effectively about complex engineering activities with the engineering community as well as the general society, and will be able to prepare reports. |
| 11 | Graduates will be able to demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments. |
| 12 | Graduates will engage themselves in self and life-long learning in the context of rapid technological changes happening in Computer Science and other domains. |

**Program Specific Outcomes (PSOs)**

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| PSO1 | Design, develop and test system software and application software for distributed and centralized computing environments to varying domain and platforms.. |
| PSO2 | Understand the working of new hardware architectures and components and design solutions for real time problems. |
| PSO3 | Model the computer based systems and design algorithms that explores understanding of the tradeoffs involved in design choices. |

**Course Outcome** versus **Program Outcomes** versus **Program Specific Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | 3 | | | | 2 | | 2 | 2 | 2 | | |
| CO2 | 3 | 2 | | | 3 | | | | | | | 3 | 2 | | |
| CO3 | 3 | 2 | | | 3 | | | | | | | 3 | 2 | | |
| CO4 | 3 | 2 | | | 3 | | | | | | | 3 | 2 | | |
| CO5 | 3 | | | | | | | | | | | 3 | 2 | | |

*S* - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

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| Assessment Methods | Assignment / Quiz / Mid-Test |

# Teaching- Learning & Evaluation

| Week | Topic/ Contents | Course Outcomes | Sample questions | Teaching learning strategy | Assessment method & schedule |
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| 1 | Basic analysis frame work, pseudo conventions, time and space complexities, asymptotic notations- Theta Notation | CO1 | Discuss various asymptotic notations | Lecture Discussion Problem solving | Assignment-1, Test- 1 Quiz-1 |
| 2 | Big oh, Big Omega, little oh and little omega notations, simple disjoint set union algorithms | CO1 | Write the algorithm for simple union | Lecture Discussion Problem solving | Assignment-1, Test- 1 Quiz-1 |
| 3 | Algorithms for simple find, weighted union and collapsing rule for find | CO1 | How weighted union and collapsing rule for find are better over simple union and find algorithms | Lecture Discussion Problem solving | Assignment-1, Test- 1 Quiz-1 |
| 4 | Depth first spanning trees, bi- connectivity of the graphs, Divide and Conquer: General method | CO1, CO2 | Define articulation point. How to delete articulation points using depth first spanning trees Solving different problems using recurrence relations | Lecture Discussion Problem solving | Assignment-1, Test- 1 Quiz-1 |
| 5 | Binary Search- Recursive and Iterative methods for binary search, merge sort, quick sort | CO2 | State merge sort algorithm and use it to sort some set of integers State quick sort algorithm and use it to sort some set of integers | Lecture Discussion Problem solving | Assignment-1, Test- 1 Quiz-1 |
| 6 | 0/1 knapsack problem, Huffman codes, Min max algm | CO2 | Explain 0/1 knapsack problem with an example | Lecture Discussion Problem solving | Assignment-1, Test- 1 Quiz-1 |
| 7 | Minimum cost spanning trees, single source shortest routing problem, Dynamic programming | CO2, CO3 | Write single source shortest path problem | Lecture Discussion Problem solving | Assignment-1,2, Quiz-1, Test-1, 2 |
| 8 | 0/1 knapsack problem, Matrix chain multiplication, Longest common subsequence, | CO3 | Find the optimal Binary search tree for the identifier set (a1, a2, a3) = (do, if, while) with equal probabilities p(i) = q(i) = 1/7, for all i | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 9 | TEST-1 | | | | |
| 10 | All pair shortest path problems, travelling sales person problem, | CO3 | Explain reliability design Given the cost matrix, solve the traveling sales man | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |

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| | | | problem using branch and bound technique? Draw the state space tree. | | |
| 11 | Back tracking, n queens problem, sum of subsets problem | CO 4 | Explain the procedure of 8-queens problem | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 12 | Graph coloring problem, Hamiltonian cycles problem | CO4 | Write an algorithm for m-coloring of a graph? | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 13 | Branch and bound, travelling sales person problem | CO4 | Write the procedure for travelling sales person problem with respect to back tracking | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 14 | 0/1 knapsack problem, LC Branch and bound | CO4 | Write the procedure for LC branch and Bound solution. Explain 0/1 Knapsack problem with respect to Dynamic programming | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 15 | FIFO branch and bound solution, NP-Hard and NP-Complete problems: Basic concepts | CO4, CO5 | Write the procedure for FIFO branch and bound solution | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 16 | Non deterministic algorithms, | CO5 | Write short notes on NP complete problem | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 17 | NP hard and NP complete problems, Cooks Theorem | CO5 | Write short notes on cooks theorem<br>Discuss SAT problem | Lecture Discussion Problem solving | Assignment-2, Test- 2, Quiz-2 |
| 18 | TEST-2 | | | | |