



# SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Narsapur, West Godavari District, A.P. 534280

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### TEACHING PLAN

| Course Code | Course Title                          | Semester | Branch | Contact Periods /Week | Academic Year | Date of commencement of Semester |
|-------------|---------------------------------------|----------|--------|-----------------------|---------------|----------------------------------|
| 23CS3 T02   | ADVANCED DATA STRUCTURES & ALGORITHMS | III      | CSE    | 6                     | 2026-27       | 13-07-26                         |

#### COURSE OUTCOMES

|   |                                                                                                                  |
|---|------------------------------------------------------------------------------------------------------------------|
| 1 | Discover the performance of an algorithm using asymptotic notation. (K2)                                         |
| 2 | Use divide and conquer technique to solve problems. (K3)                                                         |
| 3 | Understand greedy and dynamic programming techniques to solve efficient solutions for optimization problem. (K3) |
| 4 | Recognize problems suitable for back tracking, branch and bound solutions. (K1)                                  |
| 5 | Understand the complexity classes NP-Hard and NP-Complete and solve related decision problems. (K2)              |

| UNIT  | CO                                                                       | Topics No. | Topics/Activity                                 | Text Book / Reference | Contact Hour | Delivery method |
|-------|--------------------------------------------------------------------------|------------|-------------------------------------------------|-----------------------|--------------|-----------------|
| I     | Discover the performance of an algorithm using asymptotic notation. (K2) | 1.1        | Introduction to Algorithm Analysis              | T1                    | 2            | BBT             |
|       |                                                                          | 1.2        | Time Complexity analysis                        | T1                    | 2            | BBT             |
|       |                                                                          | 1.3        | Space Complexity analysis                       | T1                    | 1            | BBT             |
|       |                                                                          | 1.4        | Asymptotic Notations                            | T1                    | 2            | BBT             |
|       |                                                                          | 1.5        | AVL Trees – Creation, Insertion operations      | T1                    | 2            | BBT             |
|       |                                                                          | 1.6        | AVL Trees – Deletion operation and Applications | T1                    | 2            | BBT             |
|       |                                                                          | 1.7        | B Trees – Creation, Insertion operations        | T1                    | 2            | BBT             |
|       |                                                                          | 1.8        | B Trees – Deletion operation and Applications   |                       | 2            | BBT             |
| Total |                                                                          |            |                                                 |                       | 12           |                 |
| II    | Use divide and conquer technique to solve problems. (K3)                 | 2.1        | Heap Trees (Priority Queues) – Min Heaps        | T1                    | 2            | PPT             |
|       |                                                                          | 2.2        | Heap Trees (Priority Queues) – Max Heaps        | T1                    | 2            | PPT             |
|       |                                                                          | 2.3        | Heap Trees Operations                           | T1                    | 1            | PPT             |
|       |                                                                          | 2.4        | Heap Trees Applications                         | T1                    | 1            | PPT             |
|       |                                                                          | 2.5        | Graphs – Terminology, Representations           | T1                    | 1            | PPT             |
|       |                                                                          | 2.6        | Basic Search and Traversals                     | T1                    | 2            | PPT             |
|       |                                                                          | 2.7        | Connected Components                            | T1                    | 1            | PPT             |
|       |                                                                          | 2.8        | Biconnected Components                          | T1                    | 1            | PPT             |
|       |                                                                          | 2.9        | Applications                                    | T1                    | 1            | PPT             |
| Total |                                                                          |            |                                                 |                       | 12           |                 |



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|                                                                |                                                                                                                  |      |                                                                        |       |    |                        |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------|-------|----|------------------------|
| III                                                            | Understand greedy and dynamic programming techniques to solve efficient solutions for optimization problem. (K3) | 3.1  | Divide and Conquer: The General Method                                 | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 3.2  | Quick Sort                                                             | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 3.3  | Merge Sort                                                             | T1    | 1  | Collaborative Learning |
|                                                                |                                                                                                                  | 3.4  | Heap Sort                                                              | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 3.5  | Strassen’s matrix multiplication.                                      | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 3.6  | Greedy Method: General Method                                          | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 3.7  | Job Sequencing with deadlines                                          | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 3.8  | Knapsack Problem                                                       | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 3.9  | Minimum cost spanning trees                                            | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 3.10 | Single Source Shortest Paths                                           | T1    | 1  | PPT                    |
| Total                                                          |                                                                                                                  |      |                                                                        |       | 12 |                        |
| IV                                                             | Recognize problems suitable for back tracking, branch and bound solutions. (K1)                                  | 4.1  | Dynamic Programming: General Method                                    | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.2  | All pairs shortest paths                                               | T1    | 1  | Quiz                   |
|                                                                |                                                                                                                  | 4.3  | Single Source Shortest Paths– General Weights (Bellman Ford Algorithm) | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 4.4  | Optimal Binary Search Trees                                            | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.5  | 0/1 Knapsack                                                           | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.6  | String Editing                                                         | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.7  | Traveling Salesperson Problem                                          |       | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.8  | Backtracking: General Method                                           | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.9  | 8-Queens Problem                                                       | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 4.10 | Sum of Subsets problem                                                 | T1    | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.11 | Graph Coloring                                                         |       | 1  | PPT                    |
|                                                                |                                                                                                                  | 4.12 | 0/1 Knapsack Problem                                                   |       | 2  | PPT                    |
| Total                                                          |                                                                                                                  |      |                                                                        |       | 15 |                        |
| V                                                              | Understand the complexity classes NP- Hard and NP-Complete and solve related decision problems. (K2)             | 5.1  | Branch and Bound: The General Method                                   | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 5.2  | 0/1 Knapsack Problem                                                   | T1&T2 | 2  | Flipped learning       |
|                                                                |                                                                                                                  | 5.3  | Travelling Salesperson problem                                         | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 5.4  | NP Hard and NP Complete Problems: Basic Concepts                       | T1&T2 | 2  | BBT                    |
|                                                                |                                                                                                                  | 5.5  | Cook’s theorem NP Hard Graph Problems: Clique Decision Problem (CDP)   | T1&T2 | 2  | BBT                    |
|                                                                |                                                                                                                  | 5.6  | Chromatic Number Decision Problem (CNDP)                               | T1    | 2  | PPT                    |
|                                                                |                                                                                                                  | 5.7  | Traveling Salesperson                                                  | T1    | 1  | PPT                    |
| Course Beyond Syllabus : Spatial and Geometric Data Structures |                                                                                                                  |      |                                                                        |       | 1  |                        |
| Total                                                          |                                                                                                                  |      |                                                                        |       | 14 |                        |
| CUMULATIVE PROPOSED PERIODS                                    |                                                                                                                  |      |                                                                        |       | 68 |                        |
|                                                                |                                                                                                                  |      |                                                                        |       |    |                        |



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| Text Books:      |                                                                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S. No.           | AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION                                                                                                    |
| 1                | Horowitz, Ellis; Sahni, Sartaj; Mehta, Fundamentals of Data Structures in C++, Dinesh 2nd Edition Universities Press                                            |
| 2                | Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran , Computer Algorithms/C++ 2nd Edition University Press                                                    |
| Reference Books: |                                                                                                                                                                 |
| S. No.           | AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION                                                                                                    |
| 1                | Robert Kruse, Data Structures and program design in C, Pearson Education Asia                                                                                   |
| 2                | Trembley & Sorenson, An introduction to Data Structures with applications, McGraw Hill                                                                          |
| 3                | Donald E Knuth, The Art of Computer Programming, Vol.1: Fundamental Algorithms, Addison-Wesley, 1997                                                            |
| 4                | Langsam, Augenstein & Tanenbaum, Data Structures using C & C++, Pearson, 1995                                                                                   |
| 5                | N.Wirth, Algorithms + Data Structures & Programs , PHI                                                                                                          |
| 6                | Horowitz Sahni & Mehta, Fundamentals of Data Structures in C++, Galgottia Pub.                                                                                  |
| 7                | Thomas Standish, Data structures in Java , Pearson Education Asia                                                                                               |
| Web Details      |                                                                                                                                                                 |
| 1                | <a href="http://peterindia.net/Algorithms.html">http://peterindia.net/Algorithms.html</a>                                                                       |
| 2                | <a href="https://www.geeksforgeeks.org/dsa/advanced-data-structures/">https://www.geeksforgeeks.org/dsa/advanced-data-structures/</a>                           |
| Video Links      |                                                                                                                                                                 |
| 1                | <a href="https://www.youtube.com/playlist?list=PL54i8TI-dREZtNaEDi6pe5z8Vp6SRKS8G">https://www.youtube.com/playlist?list=PL54i8TI-dREZtNaEDi6pe5z8Vp6SRKS8G</a> |
| 2                | Abdul Bari, 1. Introduction to Algorithms (youtube.com)                                                                                                         |
| 3                | <a href="https://www.tutorialspoint.com/advanced_data_structures/index.asp">https://www.tutorialspoint.com/advanced_data_structures/index.asp</a>               |

|      | Name                  | Signature with Date   |
|------|-----------------------|-----------------------|
| i.   | Faculty I             | Mrs K.Sirisha         |
| ii.  | Faculty II            | Mrs T.Satya Sheela    |
| iii. | Faculty III           | Mr K.V.N.A.S.M.Prasad |
| iv.  | Course Coordinator    | Mr K.V.N.A.S.M.Prasad |
| v.   | Module Coordinator    | Mr B.S.Varaprasad     |
| vi.  | Programme Coordinator | Dr P.Srinivasulu      |

HOD

A-hmt.  
PRINCIPAL