



# Indraprastha College for Women

## University of Delhi

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|--------------------|---|
| Course Name:       | B.Sc.(H) Computer Science               |
| Paper Title:       | Algorithms and Advanced Data Structures |
| Unique Paper Code: |   |
| Semester:          | V                                       |
| Faculty(s):        | Dr. Manisha Bansal                      |
| Year:              | 2025                                    |

### Work Plan

| Period  | Unit No. | Learning Objective                            | Topics to be Covered                              |
|---------|----------|---|---|
| Week 1  | III      | String related data structures and algorithms | String Matching: KMP algorithm                    |
| Week 2  | III      |   | Tries: Standard Tries, Compressed Tries           |
| Week 3  | III      |   | Suffix Tries, Search Engines                      |
| week 4  | II       | Efficient searching                           | Hash Functions                                    |
| Week 5  | II       |   | Collision resolution schemes                      |
| Week 6  | VI       | Randomised data structure and algorithm       | Randomized Quicksort, Randomized Select           |
| Week 7  | VI       |   | Skip lists  |
| Week 8  | IV       | Search trees                                  | 2-4 Trees   |
| Week 9  | IV       |   | B Trees   |
| Week 10 | V        | Graph based data structures and algorithms    | Bellman Ford Algorithm,                           |
| Week 11 | V        |   | Union Find Data Structure                         |
| Week 12 | V        |   | Kruskal's algorithm                               |
| Week 13 | VII      | Network flows                                 | Ford Fulkerson algorithm for the max flow problem |
| Week 14 |          |   |   |
| Week 15 | VII      |   | Ford Fulkerson algorithm for the max flow problem |
| Week 16 | I        | List data structures                          | Vectors, Lists, Sequences                         |
| Week 17 | I        |   | Vectors, Lists, Sequences                         |
| Week 18 |          | Revision and Problem Discussion               | Revision  |
|         |          |   | DISBERSAL OF CLASSES                              |

| Unit   | TOPICS   |
|--------|--|
| I      | <b>List and Iterator ADTs:</b> Vectors, Lists, Sequences   |
| II     | <b>Hash Tables, Dictionaries:</b> Hash Functions, Collision resolution schemes.  |
| III    | <b>Strings:</b> String Matching: KMP algorithm; Tries: Standard Tries, Compressed Tries, Suffix Tries, Search Engines            |
| IV     | <b>More on Trees:</b> 2-4 Trees, B Trees   |
| V      | <b>More on Graphs:</b> Bellman Ford Algorithm, Union Find Data Structures - application Kruskal's algorithm                      |
| VI     | <b>Randomization:</b> Randomized Quicksort, Randomized Select, Skip lists  |
| VII    | Network Flows: Ford Fulkerson algorithm for max flow problem.  |
| S. No. | Name of Authors/Books/Publishers   |
| 1.     | 1. Goodrich, M.T, Tamassia, R., & Mount, D. Data Structures and Algorithms Analysis in C++, 2nd edition, Wiley, 2011.            |
| 2.     | 1. Cormen, T.H., Leiserson, C.E., Rivest, R. L., Stein C. Introduction to Algorithms, 4th edition, Prentice Hall of India, 2022. |
| 3.     | 1. Kleinberg, J., Tardos, E. Algorithm Design, 1st edition, Pearson, 2013.   |
| 4.     | 1. Drozdek, A. Data Structures and Algorithms in C++, 4th edition, Cengage Learning. 2012.                                       |

| <b>Paper Components</b>  |  |                       |                      |
|--------------------------|--|-----------------------|----------------------|
| <b>Credits</b>           | <b>Lecture (L)</b>   | <b>Tutorial (T)</b>   | <b>Practical (P)</b> |
| <b>4</b>                 | <b>3</b>   | <b>0</b>              | <b>1</b>             |
| <b>Assessment Scheme</b> |  |                       |                      |
| <b>S.No.</b>             | <b>Component</b>   | <b>Marking Scheme</b> | <b>Total Marks</b>   |
| 1                        | Internal Assessment <ul style="list-style-type: none"> <li>• Assignment/Quiz/Project/Presentation</li> <li>• Class Test</li> <li>• Attendance</li> </ul> |                       | <b>30</b>            |
|                          |  | 12                    |                      |
|                          |  | 12                    |                      |
|                          |  | 6                     |                      |
| 2.                       | Continuous Assessment ( <b>Tutorial</b> ) <ul style="list-style-type: none"> <li>• Activity 1</li> <li>• Activity 2</li> <li>• Attendance</li> </ul>     |                       | NA                   |
|                          |  |                       |                      |
|                          |  |                       |                      |
|                          |  |                       |                      |
| 3.                       | Practical <ul style="list-style-type: none"> <li>• Continuous Assessment</li> <li>• End Term Written/Practical Exam</li> <li>• Viva</li> </ul>           |                       | 40                   |
|                          |  | 10                    |                      |
|                          |  | 20                    |                      |
|                          |  | 10                    |                      |
| 4.                       | End Semester Examination   |                       | 90                   |