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| **Unit** | **Topic & sub – topic** | **Topics Covered** | **COs** | **Lectures proposed** | **Lecture delivered** | **Date** | **No. of students present**  **( )** | **Sign. of faculty** |
| **1** | Introduction: Algorithms, Analyzing Algorithms. |  | CO1 | 1 | Yes | 10th Sept,  11th Sept | 01-10th  05-11th |  |
| Basic revision of concept of recursion, linked list from data structures. |  | CO1 | 1 | Yes | 12th Sept, 13th Sept,  14th Sept | 05-12th  07-13th |  |
| Recurrence relation solvation using substitution and master’s theorem. |  | CO1 | 1 | Yes | 23th Sept,  24th Sept | 32- 23rd  23-24th |  |
| Complexity of Algorithms. |  | CO1 | 1 | Yes | 17th Sept,  18th Sept,  20th Sept | 09-17th  13-18th  21- 20th |  |
| Growth of Functions, Performance Measurements. |  | CO1 | 1 | Yes | 24th Sept | 23-24th |  |
| Sorting and Order Statistics - Shell Sort, Quick Sort. |  | CO1,CO4 | 1 |  |  |  |  |
| Sorting and Order Statistics - Merge Sort, Heap Sort. |  | CO1,CO4 | 1 |  |  |  |  |
| Comparison of Sorting Algorithms, Sorting in Linear Time. |  | CO1,CO4 | 1 |  |  |  |  |
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| **Total Lectures** | | | **8** |  |  |  |  |
| **2** | Revision of Trees and graph traversal from data structures. |  | CO4 | 1 |  |  |  |  |
| Revision of Binary search tree and AVL trees, Introduction to Advanced Data Structure: Red-Black Trees. |  | CO4 | 1 |  |  |  |  |
| Advanced Data Structure: Operations in Red-Black Trees. |  | CO4 | 1 |  |  |  |  |
| Advanced Data Structure: B – Trees. |  | CO4 | 1 |  |  |  |  |
| Advanced Data Structure: Binomial Heaps. |  | CO4 | 1 |  |  |  |  |
| Advanced Data Structure: Fibonacci Heaps. |  | CO4 | 1 |  |  |  |  |
| Advanced Data Structure: Tries. |  | CO4 | 1 |  |  |  |  |
| Advanced Data Structure: Skip List. |  | CO4 | 1 |  |  |  |  |
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| **Total Lectures** | | | **8** |  |  |  |  |
| **3** | Divide and Conquer with Examples Such as Merge sort, Quick sort, heap sort with their recurrence relation. |  | CO3 | 1 |  |  |  |  |
| Divide and Conquer: Matrix Multiplication. |  | CO3 | 1 |  |  |  |  |
| Divide and Conquer: Convex Hull and Searching. |  | CO3 | 1 |  |  |  |  |
| Introduction to Greedy and Dynamic programming paradigm. |  | CO5 | 1 |  |  |  |  |
| Greedy Methods: Optimal Reliability Allocation. |  | CO5 | 1 |  |  |  |  |
| Greedy Methods: 0/1 Knapsack. |  | CO5 | 1 |  |  |  |  |
| Greedy Methods: Minimum Spanning Trees – Prim’s and Kruskal’s Algorithms. |  | CO5 | 1 |  |  |  |  |
| Single Source Shortest Paths - Dijkstra’s and Bellman Ford Algorithms. |  | CO5 | 1 |  |  |  |  |
| **Total Lectures** | | | **8** |  |  |  |  |
| **4** | Dynamic Programming with Examples Such as fractional Knapsack. |  | CO5 | 1 |  |  |  |  |
| Dynamic Programming: All Pair Shortest Paths: Floyd’s Algorithms. |  | CO5 | 1 |  |  |  |  |
| Dynamic Programming: All Pair Shortest Paths – Warshal’s. |  | CO5 | 1 |  |  |  |  |
| Dynamic Programming: Resource Allocation Problem. |  | CO5 | 1 |  |  |  |  |
| Backtracking. |  | CO4 | 1 |  |  |  |  |
| Branch and Bound: Hamiltonian Cycles and Sum of Subsets. |  | CO4 | 1 |  |  |  |  |
| Branch and Bound: n-queens problem. |  | CO4 | 1 |  |  |  |  |
| Branch and Bound: Travelling Salesman Problem, Graph Coloring. |  | CO4 | 1 |  |  |  |  |
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| **Total Lectures** | | | **8** |  |  |  |  |
| **5** | Selected Topics: Algebraic Computation. |  | CO3,CO2 | 1 |  |  |  |  |
| Fast Fourier Transform. |  | CO3,CO2 | 1 |  |  |  |  |
| String Matching. |  | CO3,CO2 | 1 |  |  |  |  |
| P and NP Problems. |  | CO3,CO2 | 1 |  |  |  |  |
| P and NP and NP hard Problems. |  | CO3,CO2 | 1 |  |  |  |  |
| Theory of NP Completeness. |  | CO3,CO2 | 1 |  |  |  |  |
| Approximation Algorithms. |  | CO3,CO2 | 1 |  |  |  |  |
| Randomized Algorithms. |  | CO3,CO2 | 1 |  |  |  |  |
| **Total Lectures** | | | **8** |  |  |  |  |

**BBS College of Engineering and Technology Prayagraj**

**Lecture Plan**

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| Department | Computer Science |
| Program/Year/Semester/Sec | BTech 3rd Year |
| Course Name/ Course Title | Design and Analysis of Algorithm |
| Course Code | BCS 503 |
| Name of Faculty | Ms Shreya Agarwal |
| Department of Faculty | Computer Science(BBS College of Engineering and Technology) |

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| Pre-requisites for the Course | Proficiency in a programming language (C, C++, Java, Python, etc.) Understanding of data structures (arrays, linked lists, stacks, queues, trees, graphs, etc.), |
| Familiarity with basic algorithms (sorting, searching, etc.) |
|  | Discrete mathematics (combinatorics, graph theory, number theory) |
|  | Familiarity with Probability and statistics  Calculus (derivatives, integrals) |

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| Type of Course | Theory/Lecture |
| Contact hours | 40 hrs. |

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| **Course Outcomes (COs)** | |
| At the end of this course students will demonstrate the ability to: | |
| CO1 | Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands |
| CO2 | Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate). |
| CO3 | Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms. |
| CO4 | Apply classical sorting, searching, optimization and graph algorithms. |
| CO5 | Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy. |

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| **Text Books & References** | |
| 1 | Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India. |
| 2 | Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008. |
| 3 | LEE "Design & Analysis of Algorithms (POD)",McGraw Hill. |
| 4 | Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005. |
| 5 | Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006. |

Signature of Faculty Signature of HOD

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| **Comments** |  |