

**School of Computer Engineering**

**Spring Semester 2022-23**

**Kalinga Institute of Industrial Technology (KIIT)**

**Deemed to be University**

**Bhubaneswar-751024**

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**====================|| Lesson Plan ||===================**

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**Program** : B.Tech. CSSE

**Academic Session** : Spring

**Semester** : 4th

**Subject Code** : CS-2012

**Subject** : **Design & Analysis of Algorithm**

**L-T-P** : 2-1-0

**Faculty Members** : Dr. Nachiketa Tarasia

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| **Mod. No.** | **Module Name** | **Topics to be covered** | **No. of lectures** | **Lecture serial nos.** |
| **1.** | **Introduction** | Concepts in algorithm analysis & design - motivation  The complexity of an algorithm (Space and Time Complexity)  Analysis of time complexity of Insertion Sort by step count method  Growth of functions  Asymptotic notations (O, Ω, Θ)  Solving recurrences (Iterative/Substitution/ Recurrence Tree/Master theorem/Change of variable method) | **8** | **1-8** |
| **Tutorials / Activity** |
| **2.** | **Divide and Conquer**  **Method** | Structure of the Divide-and-Conquer algorithm  Analysis of divide-and-conquer run time recurrence relations of  Binary Search  Merge Sort  Quick Sort  Randomized Quick Sort | **6** | **9-14** |
| **Tutorials / Activity** |
| **3.** | **Heap** | Building a heap  Heap sort algorithm  Priority queue | **3** | **15-17** |
| **Tutorials / Activity** |
| **4.** | **Greedy Method** | Overview of t Greedy paradigm  Fractional knapsack problem  Activity selection problem  Huffman’s code | **4** | **18-21** |
| **Tutorials / Activity** |
| **5.** | **Dynamic**  **Programming** | Overview of Dynamic Programming paradigm  Difference between Divide and Conquer and Dynamic Programming  Matrix Chain Multiplication  Longest Common Subsequence | **4** | **22-25** |
| **Tutorials / Activity** |
| **6.** | **Graph Algorithms** | Dis-joint Set Data Structure  Representation Of Graph  Graph Traversals:: BFS DFS  Single-Source Shortest Path  - Dijkstra’s Algorithm  All Pair Shortest Path  - Floyd-Warshall Algorithm  Minimum Cost Spanning Tree  - Kruskal’s Algorithm  - Prim’s Algorithm | **10** | **26-35** |
| **Tutorials / Activity** |
| **9.** | **Computational Complexity** | Complexity Classes: P, NP, NP-Hard, and NP-Complete | **2** | **36-37** |
| **Tutorials / Activity** |

***Course Outcome***: At the end of the course, the students will be able to

Able to analyze the asymptotic performance of algorithms.

Able to understand different algorithm design techniques.

Able to apply important algorithm design paradigms and methods of analysis.

Able to demonstrate familiarity with major algorithms and data structures

Able to modify existing algorithms to apply in common engineering design situations.

Able to understand different classes of problems P, NP, NP-Complete, and NP-Hard.

***Text Books:***

T. H. Coreman, C. E. Leiserson, R. L. Rivest, “Introduction to Algorithms”, PHI.

E. Harwitz, S. Sahani, S. Rajsekharan, Galgotia “Fundamentals of Computer Algorithms”, Galgotia Publication.

***Reference Books:***

J. Kleinberg & E. Tardos, Algorithms Design”, Pearson International 1st Edition.

Michael Goodrich, Roberto Tamassia, “Algorithm Design: Foundations, Analysis & Internet Examples”, John Wiley & Sons.

**Pedagogy:** Lectures, Assignments, Quizzes, Debate, Summarization, Short Projects

**Evaluation Methodology:** Internal: 50 (20- Midterm Exam & 30 Activity), End Term: 50

**Distribution of Marks:**

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| --- | --- | --- | --- | --- | --- |
| **SL No.** | **Evaluation**  **Component** | **Evaluation Marks** | **Course Lecture No.** | | **Mode** |
| **From** | **To** |
| 1 | Mid-Semester Examination | 20 | 1 | 20 | Closed Book |
| 2 | Activity-based Teaching and Learning | 30 | NA | NA | Open Book, Closed Book, and Presentation, Short quiz |
| 3 | End-Semester Examination | 50 | 1 | 37 | Closed Book |

**Note:: *Tentative Mid-Semester Syllabus would be up to the Greedy Method as per the Lesson Plan.***

***Note:: Modifications to the above-mentioned structure (Lesson Plan / Examination Process / Any other modifications) may occur as per the Govt Policy / University Guidelines towards the Covid-19 pandemic.***

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