NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Semester – V

L	T	P	C
2	1	2	4

Course Code	2CS503
Course Title	Design and Analysis of Algorithms

Course Outcomes:

At the end of the course, students will be able to –

1. comprehend notion of algorithmic complexity and logic of fundamental algorithms
2. apply fundamental algorithms in real life problem solving
3. identify and evaluate suitable data structures to solve a problem effectively and efficiently.

Syllabus:

Teaching Hours: 30

Unit I **2**

Elementary Algorithmic: Efficiency of Algorithms, Average & worst-case analysis, Elementary Operation

Unit II **4**

Analysis Techniques: Empirical, mathematical, Asymptotic analysis and related unconditional and conditional notations

Analysis of Algorithms: Analysing control structures: sequencing, "For" loops, Recursive calls, "While" and "repeat" loops, Amortized analysis

Unit III **4**

Solving Recurrences: Intelligent guesswork, Homogeneous recurrences, Inhomogeneous Recurrences, Change of variable, Range transformations, Master Theorem, Recurrence Tree.

Unit IV **7**

Data Structures: Heaps, Binomial heaps, Disjoint set structures.

Greedy Algorithms: Graphs: Minimum spanning trees-Kruskal's algorithm, Prim's algorithm, Graphs: Shortest path algorithms.

Unit V **8**

Divide-and-Conquer: Multiplying large integers, Binary search, sorting: sorting by merging, quick sort, finding the median, Matrix multiplication, Exponentiation, approaches using recursion, Memory functions.

Dynamic Programming: Principles of optimality, Various applications using dynamic programming.

Unit VI 5

Branch and Bound, Backtracking: Design of some classical problems using branch and bound and Backtracking approaches.

Randomized and Approximation Algorithms: Design of some classical problems using Randomized and Approximation Algorithms.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:

Tutorial work will be based on the above syllabus with minimum 10 tutorials to be incorporated.

Suggested Readings^:

1. Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, PHI
2. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekharan, Fundamentals of Computer Algorithms,Galgotia.
3. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill
4. Karumanchi, Narasimha, Data Structures and Algorithms Made Easy, CareerMonk Publications.

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list