NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
Course Syllabus
Master of Computer Application (2-Years Programme) Semester-II

L	T	P	C
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Course Code	6CS151
Course Title	Design and Analysis of Algorithms

Course Outcomes:

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

1. identify the appropriate data structure to design an efficient algorithm for the given problem
2. implement various techniques for searching and sorting
3. apply appropriate algorithmic technique to solve a given problem
4. analyze performance of algorithms and estimate their worst-case and average-case behavior

Syllabus:

Teaching Hours: 45

Unit I — **2**

Elementary algorithm: introduction to notations for program, efficiency of algorithms.

Unit II — **10**

Asymptotic Notation: a notation for "the order of", other asymptotic notation, conditional asymptotic notation.

Analysis of algorithms: analyzing control structures: sequencing, "for" loops, recursive calls, "while" and "repeat" loops, using a barometer, amortized analysis.

Unit III — **8**

Greedy algorithms: graphs: minimum spanning trees-kruskal's algorithm, prim's algorithm, graphs: shortest paths. Knapsack problem, **scheduling:** minimizing time in the system, scheduling with deadlines.

Unit IV — **8**

Divide-and-conquer: multiplying large integers, binary search, sorting: sorting by merging, quick sort, finding the median, matrix multiplication, and exponentiation.

Unit V

Dynamic programming: making change, the principle of optimality, the knapsack problem, shortest path, chained matrix multiplication, approaches using recursion, memory functions. — **8**

Unit VI

Backtracking & branch-and-bound: basic idea, 8-queens problem, graph coloring, hamiltonian cycles, knapsack problem. — **7**

Unit VII

Introduction to np-completeness: the class P and NP, polynomial reduction, np-completeness problem, np-hard problems. **2**

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 above syllabus with minimum 8 experiments to be incorporated that will be considered for evaluation.

Suggested Readings^:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithm, PHI
2. Gills Brassard, Paul Bratley, Fundamental of Algorithms, PHI.
3. Dave and Dave, Design and Analysis of Algorithms, Pearson
4. Simen Harris, James Ross, Beginning Algorithms, Wiley India.
5. E.Horowitz and S. Sahni, Fundamentals of Computer Algorithms, Galgotia

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

^ this is not an exhaustive list