



Course Title: ELEMENTARY ALGORITHMS

Course Level: UG

Course Code: CSIT211

Credit Units: 4

L	T	P/ S	SW/F W	TOTAL CREDIT UNITS
3	1	-	-	4

Course Objectives:

The objectives of the course are:

- The students are able to analyze the algorithms based on asymptotic runtime and space complexity.
- The students can distinguish between the various algorithm designing techniques like Greedy algorithms, Dynamic Programming, Divide and Conquer, Backtracking, etc.

Pre-requisites:

- (i) Computer Architecture
- (ii) Data Structures
- (iii) Basic Mathematics

Course Contents/Syllabus:

	Weightage (%)
Module I : Introduction to algorithms	25%
Algorithms; Space and time complexity; Asymptotic notations; Recurrence relations (Substitution method; Iteration method; Recursion tree; Master Theorem). Summation formula and properties; Bounding summation.	
Module II: Searching; Sorting and Order Statistics	20%
Sorting and Searching Techniques. Insertion Sort; Selection Sort; Quick Sort; Heap Sort. Sorting in linear time.	
Module III : Data Structures	20%
B-Tree, Introduction to Red-Black Trees; Hash tables.	
Module IV : Optimization Techniques	25%

Dynamic Programming- Chain Matrix Multiplication; Longest Common Subsequence. Greedy Algorithms – Activity Selection; Huffman Codes. Backtracking algorithms.	
Module VII : String Matching	10%
Naïve String Matching algorithm; Rabin Karp algorithm.	

Student Learning Outcomes:

After completion of the course, the student will be able:

- To Demonstrate knowledge of how to measure the complexity of an algorithm, including best-case, worst-case, and average complexities as functions of the input size, as well as classification in terms of asymptotic complexity classes.
- To Recognize different algorithmic design strategies which includes recursion, divide-and-conquer, the greedy method, dynamic programming, and backtracking and branch-and bound, etc.
- To Compare different algorithm design strategies for any computational problem.

Pedagogy for Course Delivery:

The subject will be taught with the help of

- Class room teaching in form of Lectures,
- Tutorial sessions including Question – Answer sessions, Assignments and Group Discussions.
- Laboratory sessions

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total (%)
100	-	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	Attendance	Class Test	Assignment	Case Study	
Weightage (%)	5	10	5	10	70

Text & References:

- T.H. Cormen, C.E. Leiserson, R.L. Rivest “Introduction to Algorithms”, PHI, 2nd Edition, 2004.
- Ellis Horowitz, Sartaz Sahani and S. Rajasekaran “Fundamentals of Computer Algorithms”, Galgotia Publication, 1999.
- A.V. Aho, J.E. Hopcroft, J.D. Ulman “The Design & Analysis of Computer Algorithms”, Addison Wesley, Wesley, 1998.
- D.E. Knuth, “The Art of Computer Programming”, 2nd Ed., Addison Wesley, 1998.