



Sub Committee for Curriculum Development

Course Name: Design and Implementation of Algorithms

(UG/PG): UG

Number of Credits: 2

Level: 3

Learning Objective(s):

This course aims to introduce the formal techniques to support design and analysis of algorithms, focusing on the mathematical theory. The aim of this course is also to make the students learn how to develop efficient algorithms for simple computational tasks and reason about the correctness of them. It also aims to introduce the concept of graphs and heaps.

At the end of this course, the student should be able to:

1. Implement the various data structures learnt in the prerequisites and understand how the data structure and algorithm design methods impacts the performance of programs.
2. Design effective and efficient algorithms for various computing problems.
3. Determine space and time complexity of algorithms
4. Understand Recursion and its benefits
5. Use various design techniques(divide and conquer, greedy etc.)

Pedagogy

1. Lectures
2. Computer Programs for implementing concepts
3. Tutorials

Pre-requisites: Basic Knowledge of Data Structures, C/C++ Programming Language

Course Outline:

Sr. No.	Topic Name	No. Of Hrs.
1	Implementation of Data Structures	[08]
	<ul style="list-style-type: none">• Implementation of Stacks and Queues using Arrays and Linked Lists• Implementation of Trees and its traversal	
2	Performance Analysis	[08]
	<ul style="list-style-type: none">• Basic Algorithm Analysis: Space complexity and Time complexity• Different Analysis Approaches: posteriori testing, and apriori approach• Asymptotic Notations (O, Ω, Θ)• Average, Best and Worst case behaviors of algorithms	

3	Recursion	[06]
	Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm through Recurrence relations Example: Fibonacci Numbers, GCD, Factorial	
4	Algorithm Design Strategies	[04]
	<ul style="list-style-type: none"> Divide and Conquer Algorithms Greedy Algorithms 	
5	Graphs and Heaps	[04]
	<ul style="list-style-type: none"> Graphs-Definitions Implementation of Graphs using Adjacency Matrix and Adjacency Lists. Traversal of Graphs: Breadth First Search(BFS) and Depth First Search(DFS) Heap and Design of Heaps 	
	Total	[30]

Book Recommended:

1. Introduction to The Design & Analysis of Algorithms, Anany Levitin, 2nd Edition, Pearson Education, 2007.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
3. Computer Algorithms by Horowitz E., Sahni S., Rajasekaran S., Galgotia Publications, 2001.

Research Papers/Articles recommended for reading:

Suggested Evaluation Methods:

- Written Exam
- Project Work
- Assignments
- Quiz

Parallel/Similar courses the existing curriculum:

S.No.	Name of the course	Institute where it was offered
1	Data Structures	SICSR

Name of Member	Sonal Khosla				
Designation	Astt. Professor				
Org. / Inst.	SICSR				
Signature					

Name of the Expert:

Signature:

Date: