Birla Institute of Technology & Science, Pilani
K. K. Birla Goa Campus
Second Semester 2018 - 19
Course Handout (Part II)

In addition to the Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.
Course ID: **CS F211**,
Course Title: **Data Structures and Algorithms**,
Class Timings: **Tue, Thu, Sat** 10 : 00 **-** 11 : 00 **AM**
Lab Timings: **Friday,** 2 : 00 **-** 4 : 00 **PM**
Instructor-In-charge: **Dr. Swati Agarwal** (swatia@goa.bits-pilani.ac.in), Office: **A-** 402

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1. **Prerequisites**
   - Successful completion of "Computer Programming" course.
   - Mathematics for Computer Science.
   - Intermediate skills in C programming.
2. **Course Objectives and Scope**
   The primary goals of the course are:
   - Introduce mathematical and experimental techniques to analyze algorithms.
   - Introduce linear and non-linear data structures and best practices to choose appropriate data structure for a given application.

   The course covers design, implementation and applications of various data structures including linked list, stacks, queues, trees, and graphs. The scope of the course it to introduce algorithm design techniques using examples from sorting, searching, and graph theory. Discussion of designs will include complexity issues and implementation issues. The scope of the implementations will include coding as well as testing and performance evaluation.
3. **Text Books**

   T1. Introduction to algorithms by Cormen, T.H; Leiserson, C; Rivest, R.L.
4. **Reference Books**

   R1. Algorithm design: Foundations, analysis, and internet examples. Goodrich, M.T; Tamassia, R.

   R2. Data Structures with C. Seymour Lipschutz
5. **Evaluation Scheme**

S.No.	Component	Weightage	Date	Time	Remarks
1	Mid-sem	30%	Mar 14, 2019	4-5:30 PM	Closed book
2	End-sem	40%	May 9, 2019	9-12 PM	Closed/Open book
3	Evaluated Labs	30%	Friday	2-4 PM	Closed book

6. **Office Hours**: Tuesday, 11:00- 12:00 PM.
7. **Notice**: All notices concerning this course will be displayed on the News forum of Photon server. Keep an eye on ID/ARC notices as well
8. **Make-up Policy**
   - Make-up shall be granted only in genuine cases based on individual's need and circumstances and must be approved by the Instruction Division.
   - No marks will be awarded without make-up for that component
   - No make-up for evaluated lab components under any condition.
9. **Course Plan**

Modules

Module	Topic	Objective
0	Introduction	Introducing goals and motivation
I	Data structures and Algorithm analysis	Understanding elementary data structures and operations. Analyzing algorithms using recurrence relations and expressing it using asymptotic notation.
II	Linear Structure	Lists (Static and dynamic), Random v/s sequential access, Restricted access lists
III	Searching and hashing	To learn the design and implementation of searching techniques and storage structures suitable for efficient searching and Hashing
IV	Non-linear data structure- Tree	To learn the use of trees for: searching, capturing non-linear acyclic relations, traversal balancing, greedy approach
V	Non-linear data structure-graphs	To learn the use of graphs for capturing non-linear relations and to learn the design of algorithms for computing properties of those relations.
VI	Sorting	To learn different algorithms for sorting their design, efficiency and limitations. complexity and comparison of sorting methods.

Lecture Plan

Lecture	Module	Topics	Reference
1	0	Introduction and Overview	course handout
2-4	I	Algorithm Analysis- Time and Space Complexity, Asymptotic Notation, Recurrence	T1 Ch2, 3, 4
5-10	II	Linear Data Structure- Linked List, Stack, Queues	T1 Ch10
11-14	III	Searching and Hashing- Linear search, binary search, hash tables, complexity	T1 Ch11, class notes
15-19	IV	Non-linear data structure- Trees: general tree, binary tree, BST, Tree traversal, tree order conversion, B-tree, M-way tree	T1 Ch12, 18, R1 Ch2
20-22	IV	Balancing Trees- AVL, Heap: priority queue	T1 Ch6, 13, R1 Ch3
23-27	V	Non-linear data structure- Graphs: representation, traversal, shortest path (pair, all)	T1 Ch22, 24, 25 R1 Ch6, 7
28-30	V	Minimum spanning tree (greedy algorithms: kruskal, prim)	T1 Ch23, R1 Ch7
31-36	VI	Sorting- insertion, selection, quick, merge, bucket, and radix. Complexity and limitations	T1 Ch6,7,8, R1 Ch4

10. **Evaluation Policy**

- Attempt of cheating or plagiarism in mid-term or end-term exam will get you an E.
- Attempt of cheating or plagiarism in evaluative labs will get you 0 for the component.
- There will be N evaluated announced lab sessions. Prior announcement will be made in the class and the course site on Moodle.
- Out of N number of evaluated lab components, best (N-2) will be considered for final grading.

Instructor In-charge
Dr. Swati Agarwal