BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI-HYDERABAD CAMPUS,
INSTRUCTION DIVISION, FIRST SEMESTER 2012 – 2013
COURSE HANDOUT (PART II)

Date : 27.12.2012

In addition to part I (General Handout for all courses appended to the time table), this portion gives specific details regarding the course.

Course Number	**:**	**CS F211 / IS F211**
Course Title	**:**	**Data Structures & Algorithms**
Instructor- in - Charge	**:**	**Dr. N.L.Bhanu Murthy**
Instructors	**:**	**Dr. N.L.Bhanu Murthy(Lectures)**
		Dr. N.L.Bhanu Murthy(Tutorial 1 & Tutorial 2)
		Mr. Samant Singh (Lab 1)
		TBD (Lab 2)

1. Course Objective

The main objective of this course is to introduce structures for storing, retrieving and manipulating data. The techniques for designing data structures and their appropriateness to a given scenario will be discussed in this course. It aims to discuss the algorithmic techniques to solve numerous problems and also introduces the application of mathematical and experimental techniques for analyzing the complexity of algorithms and techniques for using such analysis in design. It also provides insight into graph search methods, graph algorithms and complexity theory.

2. Course Pre-requisites

This course assumes familiarity with basic programming skills.

3. Course Scope

The course covers design, implementation and applications of data structures including stacks, queues, priority queues, linked lists, hash table, heap, binary search tree, balanced binary search tree. The course covers algorithm design techniques like Divide and Conquer, Greedy Approach, Dynamic Programming, Backtracking, Branch & Bound for designing algorithms using examples from sorting, searching, graph theory and real life problems as well as techniques for analyzing the complexity of such algorithms.

4. Text Books

T1. Micheal T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples (John Wiley &Sons, Inc., 2002)

5. Reference Books

R1. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. ***Introduction to Algorithms,*** *MIT Press,* Second Edition (*Indian reprint: Prentice-Hall).*

R2. Jon Kleinberg and Eva Tardos. ***Algorithm Design***. Pearson Education. (2007)

R3. Sanjoy Das Gupta, Christos Papadimitriou, Umesh Vazirani, AlgorithmsTata McGraw-Hill Publishers

R4. Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman. Data Structures and Algorithms

R5. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran. **Computer Algorithms**

6. Lecture Schedule:

Lect.	Topics	Reading
1 – 2	Course Introduction & Motivation.	-
3 – 4	Growth of Functions & Asymptotic Notation	T1 – 1.1 to 1.4 / R1 – 2 to 3
5 – 10	Sorting Algorithms – Bubble Sort, Quick Sort, Insertion Sort, Merge Sort, Heap Sort, Radix Sort and Bucket Sort Lower bound for comparison based sorting algorithms	T1 – 4.1, 4.3, 4.4, 4.5 / R1 – 2.1, 6 to 8
11	Selection Algorithm	T1 – 4.7
12 – 16	Data Structures – Stacks, Queues, Priority Queues, Sets, Heaps, Hash Tables (Approaches, Implementation Issues, Complexity & Efficiency)	T1 – 2 / R1 – 10 to 11
17 – 19	Data Structures –Binary Search Tree, Red-Black Trees (Approaches, Implementation Issues, Complexity & Efficiency)	R1 - 12 to 13
20	Amortized Analysis	T1 – 1.5 / R1 - 17
21 – 22	Graph Search Methods: BFS, DFS	R1 – 22.1 to 22.3
23 – 25	Divide and Conquer and its application to Computational Geometry problems, Matrix Multiplication and other problems, Master Method	T1 – 5.2 R1 – 4
26 -29	Dynamic Programming (Fibonacci , LCS, Matrix Multiplication, Stamp and Knapsack problems)	T1 – 5.3 R1 – 15
30 – 32	Greedy Algorithms (Huffman Code, Task Selection, Fractional Knapsack Problems etc.)	R1 – 16 T1 – 5.1
33 – 35	Back Tracking, Branch & Bounding	R5
36 – 38	Graph Algorithms Shortest Path Algorithms: Dijkstra's, Floyd-Warshall's etc MST Algoirthms : Borůvka, Kruskal, Prim	T1 – 6 to 7 R1 – 23 to 25
39 – 40	Complexity Class - P, NP, NP Complete, NP Hard Is P = NP? and Reductions.	R1 – 34
41	Summary and Conclusion	-

Evaluation Components

Component	Weightage (out of 300)	Duration	Date	Mode
Test 1	**60**	60 minutes	22/02/2013	Closed Book
Test 2	**60**	60 minutes	02/04/2013	Closed Book
Lab– Continuous Evaluation & Final Test	**60 (Continuous Evaluation - 40 & Final Lab Test – 20)**	Every lab will be evaluated. Final lab examination will be of two hours		Open Book
Comprehensive	**120**	3 hours	02/05/2013	Closed Book

7. Make-up Policy:

Make-up will be granted strictly on prior permission and on justifiable grounds only.

8. **Course Notices**

All notices pertaining to this course will be displayed on the LTC Notice Board as well as the CS & IS Notice Board.

9. Chamber Consultation: Friday 1500Hrs to 1700Hrs @ B219

Instructor-in-Charge
CS F211 / IS F211