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**SECOND SEMESTER 2019-2020**

# Course Handout Part II

Date:06-01-2020

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

*Course No.* :  *CS F211*

## Course Title : Data Structures & Algorithms

## Instructor-in-Charge : N.L.Bhanu Murthy

**Scope and Objective of the Course:**

The main objective of this course is to introduce structures for storing data and algorithms for retrieving/manipulating data. It incorporates techniques for designing such structures. The course covers design, implementation and applications of data structures including linked lists, stacks, queues, heaps, hash tables, balanced binary search trees, and graphs. This course also introduces mathematical and experimental techniques for analyzing the complexity of algorithms. The course discusses sorting and searching algorithms with detailed analysis on complexity of algorithms. The course introduces algorithm design techniques like Divide and Conquer, Greedy, Dynamic Programming to solve various interesting problems.

At the end of the course the student should be able to

* Understand Asymptotic notation and apply the same to analyze algorithms.
* Understanding of basic data structures with the complete analysis and implementation details.
* Understanding of sorting and searching algorithms.
* Understanding of basic algorithmic techniques.
* Apply appropriate data structure and algorithms to solve problems.

**Textbooks:**

**T1.**  Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein.  ***Introduction to Algorithms,*** *MIT Press,* Second Edition (*Indian reprint: Prentice-Hall).*

**Reference books**

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

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

**R3.** Sanjoy Das Gupta, Christos Papadimitriou, Umesh Vazirani, ***Algorithms***, Tata McGraw-Hill Publishers

**Course Plan:**

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| **Lecture No.** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1 – 2 | To introduce data structures and algorithms | Course Introduction & Motivation. | T1 – 1 |
| 3 – 4 | To understand analysis of algorithms | Growth of Functions & Asymptotic Notation | T1 – 2,3,4 |
| 5 - 13 | To understand sorting algorithms | Sorting Algorithms – Bubble Sort, Quick Sort, Insertion Sort, Merge Sort, Heap Sort, Radix Sort and Bucket Sort  Lower Bound on Complexity of Sorting Algorithms | T1 – 6, 7, 8 |
| 14 - 16 | To understand selection techniques | Selection Algorithms, MoM problems | T1 - 9 |
| 17 – 25 | To understand base data structures | Data Structures – Stacks, Queues, Trees, Priority Queues, Linked Lists, Heaps,  (Approaches, Implementation Issues, Complexity & Efficiency) | T1 – 10 |
| 27 – 28 | To understand hash tables | Data Structures – Hash Tables (Separate  Chaining vs. Open Addressing, Probing, Rehashing) | T1 – 11 |
| 29 – 30 | To understand binary search trees | Data Structures –Binary Search Tree, Balanced Binary  Search Trees - Red-Black Trees  Skip list (Approaches, Implementation Issues,  Complexity & Efficiency) | T1 – 12, 13 |
| 31 – 38 | To understand algorithm techniques | Algorithm Techniques – Divide & Conquer, Greedy, Dynamic Programming, Back Tracking and Branch & Bound | T1 – 4, 15, 16 |
| 39 – 41 | To understand graph algorithms | Graphs & Graph Algorithms: Representation schemes, Traversals, Problems on Weighted Graphs - Shortest Path Algorithms: Dijkstra’s, Floyd-Warshall’s etc) | T1 – 22, 24 |

**Evaluation Scheme:**

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| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Mid Test | 90 minutes | 25% | 4/3 1.30 -3.00 PM | Closed Book |
| Lab – Continuous Evaluation & Final Test | Every assignment will be evaluated.  Final lab examination will be of two hours | 35% (Assignments by Continuous Evaluation (25%) &  Final Lab Test (10%)) | TBD | Open Book |
| Comprehensive | 3 hours | 40% | 08/05 FN | Closed Book |

**Chamber Consultation Hour:** To be announced in the class.

**Notices:** All notices pertaining to this course will be displayed on the CS & IS Notice Board.

**Make-up Policy:** Prior Permission is mustand Make-up shall be granted only in genuine cases based on individual’s need, circumstances. The recommendation from chief warden is necessary to request for a make-up.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**