BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, Hyderabad

**FIRST SEMESTER 2023-2024**

**COURSE HANDOUT(PART-I)**

Date : 11/08/2023

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

**Course No. :** CS F222

**Course Title :** Discrete structures for Computer Science

**Instructor In Charge** **: Prof. N.L.BHANU MURTHY**

**Team of Instructors** : Dr.Raghunath Reddy, Dr. Sameera

**Scope and Objectives of the course:**

This course aims to provide the mathematical foundations for many computer science courses including data structures, algorithms, databases theory, automata theory, formal languages, compiler theory, computer security, and operating systems. This course can develop mathematical maturity to understand and create mathematical arguments. The course encompasses topics like methods of proof (induction, contradiction, proof by cases etc), set theory, functions, relations, partially ordered sets, lattices, graph theory, basic number theory and its application to cryptography, algebraic structures & coding theory.

The objectives of the course are to:

* Equip students with mathematical foundations to study computer science subjects
* Understand different methodologies to prove or disprove a given proposition
* Understand mathematical structures and solve practical problems using these structures
* Understand advanced counting techniques

**TEXT BOOK :**

**T1. Kenneth Rosen:** Discrete Mathematics and its applications, seventh editions, Tata McGrawHill Education Private Limited

**REFERENCE BOOK :**

**R1. Mott , Abraham & Baker** : Discrete Mathematics for computer scientist & Mathematicians, PHI, 2nd edition 2002.

**R2. KOLMAN , BUSBY & ROSS :** Discrete Mathematical Structures , PHI 2003

**R3. ROSS & WRIGHT :** Discrete Mathematics PHI 2nd edition , 1988.

**5. COURSE PLAN:**

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| --- | --- | --- | --- |
| **Lecture No.** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1 | To introduce the course | Introduction to Discrete Structures and its applications to Computer Science, Course overview | Class Notes |
| 2 – 5 | To understand different methodologies to prove or disprove a given proposition | Methods of Proof – Week and Strong Induction, Proof by Contradiction, Proof by cases etc.  Circular Reasoning, Disproving a proposition | T1 – Ch 1.8,  Ch.4.1 to 4.3 |
| 6 – 8 | To learn sets, functions and their equivalent representations | Set Theory, Function, Introduction to Godel’s Incompleteness Theorem and Russel’s Paradox | T1 – Ch.2.1. to 2.3., Class Notes |
| 9 – 14 | To learn relations, partial ordered sets and lattice theory with applications to computer science | Relations, Partially Ordered Sets, Equivalence Relation, Lattice Theory | T1 Ch.7 |
| 15 – 22 | To understand fundamentals concepts in graph theory | Graph Theory - Basic concepts, Isomorphism, Subgraphs, Special Graphs, Planar Graphs, Multi Graphs, Eulerian & Hamiltonian cycles/paths, Graph Coloring | T1 – Ch.8 |
| 23 – 26 | To understand fundamental concepts of trees, spanning trees and algorithms to generate Minimum Spanning Trees | Trees, Spanning Trees, Minimum Spanning Trees | T1 – Ch.9 |
| 27-33 | To learn basic number theory concepts required for cryptography | Basics in Number Theory – Primes, Factorization, GCD, Residues and application to cryptography | T1- Ch. 3.4. to 3.7 |
| 34 – 36 | To understand techniques of counting | Combinatorics – Simple & Generalized Pigeonhole Principle, Inclusion-Exclusion etc. | T1 – Ch.5.1 to 5.3 |
| 37 – 39 | To understand recurrence and recurrence relations | Recurrence, Recurrence Relation | T1 – Ch.4.3 & 4.4, Ch.6.1 & 6.2 |
| 40 – 42 | To learn Groups, Rings, Fields and Coding Theory | Algebraic Structures – Monoids, Groups, Rings and Coding Theory | T1 – Ch.11 |

**EVALUATION SCHEME:**

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| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage** | **Date & Time** | **Remarks** |
| **Mid Test** | **90 mins** | **30%** | 09/10 - 9.30 - 11.00AM | **Close Book** |
| **Class Participation** | **5 – 10 mins** | **10%** | Surprise | **Open Book** |
| **Assignments** | **Take Home** | **20%** |  | **Open Book** |
| **Comprehensive Examination** | **180 mins** | **40%** | 06/12 FN | **Close Book** |

**CHAMBER CONSULTATION HOUR:** Thursday 1600Hrs – 1700Hrs @H119

**Make-up:** Make-up will be granted only to genuine cases with prior permission only. No makeup for class participation and assignments.

**NOTICES:** All notices about the course will be put on CSIS Notice Board.

**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**

**CS F222**