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**FIRST SEMESTER 2021-2022**

# Course Handout Part II

Date: 20-08-2021

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 F222

## Course Title : Discrete Structures for Computer Science

## Instructor-in-Charge : Raghunath Reddy M

## Instructors : Manjanna B and K Simran

**Scope and Objective 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

**Textbooks:**

**T1. Kenneth H. Rosen:** Discrete Mathematics and its applications, 8th edition, Tata McGrawHill Education Private Limited.

**Reference books**

**R1. Eric Lehman, F Thomson Leighton, Albert R Meyer,** Mathematics for Computer Science, 2018

**R2. Martin Aigner, Gunter M. Ziegler,** Proofs from THE BOOK

**R3. Mott, Kandel, Baker,** Discrete Mathematics for Computer Scientists and Mathematicians

**R4. Douglas West:** Introduction to Graph Theory, PHI, 2nd edition, 2011

**R5. Miklos Bona:** A Walk Through Combinatorics, World Scientific, 3rd edition

**R6. David Burton:** Elementary Number Theory, TMH, 7th edition

**R7. Tremblay and Manohar**, Discrete Mathematical Structures with Applications to Computer Science, Tata Mc-Graw-Hill Edition 1997.

**R8. C. L. Liu**, Elements of Discrete Mathematics, Second Edition.

**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 |
| 2-3 | 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. | T1 – Ch.1 & Ch.5 |
| 4-5 | To learn sets, functions and their equivalent representations | Set Theory, Function | T1 – Ch.2 |
| 6-8 | To learn relations, partial ordered sets and lattice theory with applications to computer science | Relations, Equivalence Relation, and Partially Ordered Sets, | T1 Ch.9 |
| 9-11 | To understand techniques of counting | Basics of Counting, Pigeonhole Principle, Inclusion-Exclusion. | T1 – Ch.6 |
| 12-16 | To understand recurrence and recurrence relations and how to solve them | Recurrence Relation and Generating functions, Solving recurrence relations using generating functions | T1 – Ch.5 & Ch.8,  R3 |
| 17-21 | To understand fundamentals concepts in graph theory | Graph Theory - Basic concepts, Isomorphism, Subgraphs, Special Graphs, Planar Graphs, Multi Graphs, Eulerian & Hamiltonian cycles/paths, | T1 – Ch.10, R3 and R4 |
| 22-26 | To understand fundamental concepts of trees, spanning trees and algorithms to generate Minimum Spanning Trees | Trees, Spanning Trees, Minimum Spanning Trees, Chromatic numbers and Graph Coloring | T1 – Ch.11,  R3 and R4 |
| 27-32 | To learn basic number theory concepts required for cryptography | Basics in Number Theory – Primes, Factorization, GCD, Residues and application to cryptography | T1- Ch. 4 |
| 33-40 | To learn Groups, Rings, Fields and Coding Theory | Algebraic Structures – Monoids, Groups, Rings and Coding Theory | R7- Ch. 3-4  R8 -Ch.11-12 |

**Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| **Quiz-1** | **30 mins** | **10%** | To be announced  (before mid-sem) | **Open Book** |
| **Quiz-2** | **30 mins** | **10%** | To be announced  (post mid-sem) | **Open Book** |
| **Assignments (2 Nos.)** | **Take Home** | **15%** | To be announced  (one before mid-sem and one after mid-sem) | **Open Book** |
| **Mid-Sem** | **90 mins** | **28%** | 18/10/2021 9.00 - 10.30AM | **Open Book** |
| **Comprehensive Examination** | **120 mins** | **37%** | 11/12 FN | **Open Book** |

**Mid-Semester grading:**  Minimum 40% weightage will be considered for the mid-sem grading.

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

**Notices:** All notices about the course will be put on CMS.

**Make-up Policy:** Make-up (other than Compre) will be granted only to genuine cases with prior permission only. For Comprehensive exam, make-up has to be approved and scheduled by AUGSD.

**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**

**Raghunath Reddy M**