Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2020-2021

Course Handout Part II

Date: 17-08-2020

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 F222
Course Title : *Discrete Structures for Computer Science*
Instructor-in-Charge : Manjanna B
Instructors : Mrityunjay Singh, Ramaswamy Venkatakrishna, Rajita B S A S, S Vishwanath Reddy

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. Ronald Graham, Donald Knuth, and Oren Patashnik, Concrete Mathematics: A Foundation for Computer Science

R4. Lovasz et al. Discrete Mathematics, Elementary and Beyond

R5. Mott, Kandel, Baker, Discrete Mathematics for Computer Scientists and Mathematicians
R6. Douglas West: Introduction to Graph Theory, PHI, 2nd edition, 2011
R7. Miklos Bona: A Walk Through Combinatorics, World Scientific, 3rd edition
R8. David Burton: Elementary Number Theory, TMH, 7th edition
R9. Tremblay and Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata Mc-Graw-Hill Edition 1997.
R10. C. L. Liu, Elements of Discrete Mathematics, Second Edition.

Course Plan:

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	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 & Ch.5
3 – 4	To learn sets, functions and their equivalent representations	Set Theory, Function, Introduction to Godel's Incompleteness Theorem and Russel's Paradox	T1 – Ch.2 & Class Notes
5 – 7	To learn relations, partial ordered sets and lattice theory with applications to computer science	Relations, Partially Ordered Sets, Equivalence Relation, Lattice Theory	T1 Ch.9
8 – 12	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.10,R6
13 – 17	To understand fundamental concepts of trees, spanning trees and algorithms to generate Minimum Spanning Trees	Trees, Spanning Trees, Minimum Spanning Trees	T1 – Ch.11,R6
18 – 22	To understand techniques of	Combinatorics – Simple & Generalized Pigeonhole Principle, Inclusion-Exclusion	T1 – Ch.6

	counting	etc.	
23 – 27	To understand recurrence and recurrence relations and how to solve them	Recurrence, Recurrence Relation and Generating functions, Discrete Geometry	T1 – Ch.5 & Ch.8, R2
28 – 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	R9- Ch. 3-4 R10 -Ch.11-12

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Test-1	**30 mins**	**15%**	September 10 – September 20 (during scheduled class Hour)	**Open Book**
Test-2	**30 mins**	**15%**	October 9-October 20(during scheduled class hour)	**Open Book**
Test-3	**30 mins**	**15%**	November 10-November 20 during scheduled class hour)	**Open Book**
Assignments(2)	**Take Home**	**20%**	To be announced	**Open Book**
Comprehensive Examination	**120 mins**	**35%**	As announced in the Timetable	**Open Book**

Chamber Consultation Hour: Saturday 12-1 PM (meet.google.com/bwv-nnjw-jdy)

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

Make-up Policy: Make-up will be granted only to genuine cases with prior permission only.

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
Manjanna B