Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2022-23

Course Handout Part II

Date:29.08.2022

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. : **MATH F215**
Course Title : **Algebra I**
Instructor-in-Charge : **Pratyusha Chattopadhyay**
Instructor **: Pratyusha Chattopadhyay, Debopam Chakraborty**

Scope and Objective of the Course: Group theory and ring theory are the fundamental building blocks of abstract algebra. Knowledge of this course will help a student to pursue courses on advanced algebra.

The objective of this course is to introduce basics of group theory and ring theory. In group theory we will introduce concept of groups, subgroups, homomorphisms, isomorphisms, quotient groups, normal subgroups, and cosets. We will then learn about some of the important theorems like Lagrange's theorem, Cayley's theorem, Sylow's theorem. In ring theory we will introduce concepts of rings, subrings, integral domains, ideals, quotient rings, isomorphism theorem, Euclidean domains, principal ideal domains, unique factorization domains, and related results.

Text Book: I. N. Herstein, Topics in Algebra, 2nd Edition, John Wiley, 1975.

Reference Books:

1. Joseph A. Gallian, Contemporary Abstract Algebra, Seventh Edition, Brooks / Cole, Cengage Learning.
2. John B. Fraleigh, A First Course in Abstract Algebra, 3rd Edition, Narosa.
3. Dummit & Foote, Abstract Algebra, Third Edition, Wiley.
4. Jacobson H., Basic Algebra I, Feemass HPC, 1982.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1	Preliminaries	Basics of set theory, mappings, equivalence relations, integers modulo n (Z/nZ)	1
2 – 3	To learn about basics to group theory, like groups, subgroups, normal subgroups, quotient groups,	Definitions and examples of groups and a few preliminary lemmas	2.1 - 2.3
4 – 6		Subgroups and counting principle	2.4, 2.5

7 – 9	permutation groups, homomorphisms, automorphisms, a few counting principles, and Sylow's theorem and its applicaitons	Normal subgroups and quotient groups	2.6
10 – 14		Homomorphisms, automorphisms, and Cayley's theorem	2.7 - 2.9
15 – 19		Permutation Groups, Another Counting Principle	2.10, 2.11
20 – 26		Sylow's Theorems	2.12
27 - 28	To learn basics of ring theory, like rings, subrings, ideals, prime idelas, maximal idelas, quotient rings, polynomial rings, Euclidean rings, PIDs and UFDs	Definition and examples of rings and few preliminary lemmas	3.1, 3.2
29		Ring homomorphisms and examples	3.3
30 - 32		Ideals & quotient rings	3.4, 3.5
33 - 34		Fields of quotient of an integral domain	3.6
35 - 37		Euclidean rings and a particular example	3.7, 3.8
38 - 40		Polynomial rings and polynomials over the rational field	3.9, 3.10

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-semester exam	90 mins	25	05/11 9.00 - 10.30AM	Closed book
Quiz-I		15	Will be announced	Open book
Assignment		10	Will be announced	Open book
Quiz-II		15	Will be announced	Open book
Comprehensive	180 mins	35	30/12 FN	Closed book

The total marks of all the components, taken together will be 100.

Chamber Consultation Hour: To be announced by the respective Instructor.

Notices: The notices concerning this course will be announced on the CMS Notice Board only.

Make-up Policy: Make-up for tests will be given only for genuine cases and prior permission has to be obtained from the Instructor In-charge.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and any type of academic dishonesty is not acceptable.

INSTRUCTOR-IN-CHARGE (MATH F215)