FIRST SEMESTER 2018-2019

Course Handout (Part II)

Date: 02/08/2018

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	**: JITENDER KUMAR**

1. Scope and Objective of the Course :

The objective of this course is to teach the importance of fundamental algebraic structures in modern mathematics and to relate the general results so obtained to concrete applications.

2. **Text Book:** I.N. Herstein : Topics in Algebra, 2nd ed., John Wiley (1999)

3. Reference Books :

1. Michael Artin : Algebra, 1st edition, Prentice Hall of India (1991)

2. John B. Fraleigh : A First Course in Abstract Algebra, 7th edition, Pearson (2003)

3. David S. Dummit & Richard M. Foote : Abstract Algebra, 2nd edition, John Wiley (1999).

4. Joseph Gallian : Contemporary Abstract Algebra, 8th edition, Brooks/Cole, Cengage learning (2012).

4. Course Plan

Module Number	Lecture session	Sections	Learning Outcome
1. Introduction to Group, structure and their properties	L1.1-1.2 Definition and Examples of Groups	2.1, 2.2	Understanding the concept of group structure
	L1.3. Preliminary Lemmas	2.3	
2. Introduction to subgroups and a special class of subgroups	L2.1-2.2 Subgroups	2.4	Concept of subgroup has more implications than a subset. Generalization of modular arithmetic to arbitrary groups
	L2.3 A counting Principle	2.5	
	L2.4 -2.5 Normal subgroups	2.6	
	L 2.6 Quotient groups		
3. Structure preserving maps between two groups	L3.1 -3.2 Homomorphisms	2.7	Which re-labeling of group elements is allowed?
	L3.3 Automorphisms	2.8	
4. Abstract groups are not that abstract after all	L4.1 Cayley's theorem	2.9	To learn how to extend group structure to finite permutation groups and applications of Cayley's theorem
5. An important group in algebra	L5.1-5.3 Permutation Groups	2.10	Knowledge about the permutation group and its subgroups
6. Introduction to class equation of a group, their applications and Sylow's theorems	L6.1-6.2 Another counting principle	2.11	To learn applications of class equation. Able to apply Sylow theorems to analyze the structure of groups and to rule out existence of simple groups of certain orders
	L6.3-6.4 Sylow's theorems	2.12	
7. Introduction to Ring	L7.1 Definition & Examples of Rings	3.1	Basic concepts of

structure	L7.2 Ring of real Quaternions	3.2	ring
8. Structure preserving maps between two ring structure	L8.1-8.2 Homomorphisms	3.3	Which maps between rings relate their structures?
9. Construction of Quotient rings and their properties	L9.1-9.3 Ideals and Quotient rings	3.4, 3.5	To learn modular arithmetic in rings
10. Embedding of an integral domain into a field	L10.1-10.2 Field of Quotients of Integral Domain	3.6	To know about the process of creating fractions
11. Important rings in algebra	L11.1-11.5 Euclidean rings and Principal Ideal Rings	3.7, 3.8	Algebraic properties of these rings, examples, irreducibility of polynomials over a field and construction of a field
	L11.6-11.7 Polynomial rings	3.9	
12. Rings in which factorization is a reliable process	L12. 1- 12.4 Factorization of polynomials, Unique Factorization Domains	3.10, 3.11	Irreducibility of polynomials with rational coefficients, algebraic properties of unique factorization domain

***In tutorial classes, practice problems will be discussed on the topics covered in previous lectures.**

5. Evaluation Scheme:

ECN o.	Evaluation Component	Duration	Weightage (marks)	Date & Time	Nature of Component
1.	Mid Term Test	90 min.	35% (70)	12/10 2:00 - 3:30 PM	Closed Book
2.	Quizzes		20% (40)	unannounced	Closed book
3.	Compre. Exam.	3 hrs.	45% (90)	12/12 FN	Open & Closed Book

Upon Successful completion of **MATH F215 Algebra 1** student should be able to:

(i) Assess properties implied by the definitions of groups and rings,

(ii) Use of various canonical types of groups (including cyclic groups and groups of permutations) and canonical types of rings (including Polynomial rings, Euclidean rings and Principal ideal rings),

(iii) Analyze and demonstrate examples of subgroups, normal subgroups and quotient groups,

(iv) Analyze and demonstrate examples of ideals and quotient rings,

(v) Use the concepts of isomorphism and homomorphism for groups and rings, and

(vi) Produce rigorous proofs of results (theorems, propositions and lemmas) arising in the context of abstract algebra.

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

7. **Notices:** Notices concerning this course will be displayed on the Notice Board of Mathematics Group. Also NALANDA web-site can be used to post course material as well as notices.

8. **Makeup:** Prior permission is needed for makeup; makeup will only be given if enough evidence is there for not being able to take Midsem/Compre. **Quizzes will not have any make-ups.**

(Jitender Kumar)

Instructor In charge

MATH F215