Gyanmanjari
Innovative University

Subject: Algebra – I (MSCMA12509)

Type of course: Major

Prerequisite: A strong foundation in basic algebra, set theory, linear algebra, mathematical proof, logic, and some exposure to number theory is typically required.

Rationale: Algebra - I serves as the theoretical foundation of calculus. It aims to provide a rigorous framework for the concepts introduced in calculus, such as limits, derivatives and integrals by establishing a solid mathematical basis.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10·	-	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weight age
1	**CHAPTER 1: Introduction to Groups** Definition and example of Groups, Properties of Groups, Define order of Groups, Definition and example of Finite Groups and Infinite Groups, Definition and example of Subgroups, Definition and example of Cyclic Groups	15	25
2	**CHAPTER 2: Permutation Groups** Definition of Permutation Groups, Properties of Permutation Groups, Definition and example of Alternating group of degree n, Group isomorphisms and their properties, Cayley's Theorems, Cosets and Langrange's Theorem	15	25
3	**CHAPTER 3: External Direct Products** Definition of External Direct Products, Properties of External Direct Products, Normal Subgroups, Factor Groups and their applications, Internal Direct Products	15	25

4	**CHAPTER 4: Group Homomorphisms** Definition of Group Homomorphisms, Properties of Group Homomorphisms, Fundamental theorem of finite abelian groups, First Isomorphism Theorem, The isomorphism classes of abelian groups, Sylow Theorems (Existence and Uniqueness of Sylow Subgroups), Definition and example of Simple groups	15	25

Continuous Assessment:

Sr. No.	Active Learning Activities	Marks
1.	**Research Activity:** Faculty will assign Topic of algebraic expression and Students will analyze and prepare chart and upload to the GMIU web portal.	10
2.	**Brain writing :** Faculty will provide a picture, text passage or video clip, student observe, analyze and write about it.	10
3.	**Solving Mathematical Logic Problem :** Various problems based on groups, permutations, isomorphisms, direct products, and homomorphisms to the students. Students need to submit Mathematical logic and Solution via the GMIU web portal..	10
4.	**Analysis :** Faculty will assign analysis activities across the entire Group Theory and students will analyze and prepare a report in 100 words and upload it to the GMIU web portal..	10
5.	**Concept mapping :** Faculty will assign real time project / problem that Students map their Idea, Solution for real time project / problem and upload it to the GMIU web portal.	10
Total		**50**

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand and apply group operations, including closure, associativity, identity element, and inverses.
CO2	Understand the concept of symmetric groups and alternating groups.
CO3	Define and apply operations on factor groups
CO4	Identify and analyze examples of groups and homomorphisms relevant to the theorem.

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)					
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	10%	40%	20%	10%	20%	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MCQ etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

Reference Books:

1. Joseph Gallian – Contemporary Abstract Algebra (Narosa Publishing House).

2. I.S. Luthar and I.B.S. Passi :Algebra (Volume 1) Groups (Narosa Publishing House)

3. I.N. Herstein : Topics in Algebra (Wiley - Eastern Ltd)

4. M. Artin : Algebra (Prentice Hall)

5. N.S. Gopalkrishna : University Algebra.(Wiley - Eastern Ltd)

6. Fraleigh : A First Course in Abstract Algebra

7. Herstein : Topics in Algebra (Wiley - Eastern Ltd)

8. Dummit and Foote : Abstract Algebra (Wiley - Eastern Ltd)