Course Specification
(Bachelor)

Course Title:	**Modern Algebra**
Course Code:	**MAT 1321**
Program:	**Bachelor of Science in Applied Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**08/10/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorial)					
2. Course type					
A.	☐University	☐ College	☒ Program	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 5 / Year 3					
4. Course general Description:					
The course introduces key algebraic structures, focusing on group theory, ring theory, and polynomial rings. Students will study groups, subgroups, cosets, Lagrange's theorem, and finite Abelian groups, as well as ring homomorphisms, ideals, and quotient rings. The course also covers polynomial rings and irreducibility criteria. This foundational knowledge equips students with essential skills for advanced mathematical study and research.					
5. Pre-requirements for this course (if any):					
MAT 1123 Linear Algebra and MAT1225 Introduction to Number Theory					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to provide essential knowledge of algebraic structures that support various mathematical theories and applications. It develops abstract reasoning and problem-solving skills crucial for advanced studies and research in fields like cryptography, coding theory, and computational mathematics.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	0

3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		75

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Identify fundamental structures of abstract algebra including groups, rings, fields, and integral domains by definitions and examples and non-examples	K1	4 lecture hours\week 2 tutorial hours\week Self-study	Regular Exams Assignments Short Quizzes
1.2	Discuss the fundamental theorem of finite Abelian groups, integral domains and fields, principal ideal domains, and polynomial rings.	K2	4 lecture hours\week 2 tutorial hours\week Self-study	Regular Exams Assignments Short Quizzes
2.0	**Skills**			
2.1	Apply fundamental theorems of modern algebra such as Syllow Theorem and isomorphism theorems, and Irreducibility criteria to solve problems in applied settings.	S1, S2	Self-study Real-life problems	Participations Short Quizzes
2.2	Write to communicate the topics of modern algebra using rigorous proof writing conventions, explanations, and correct mathematical notation.	S4	Self-study Real-life problems	Participations Short Quizzes
2.3	Use information technology to algebraic structures in the context of modern algebra topics	S5	Self-study Real-life problems	Participations Short Quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	through consideration of examples.			
2.4	Analyze similarities and differences between algebraic structures including groups, rings, fields, and integral domains.	S3	Self-study Real-life problems	Participations Short Quizzes
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate a sense of self-worth	V1, V3	Class discussion	Individual classwork
3.2	Relate well to others and maintain good relationships;	V1, V2	Class discussion and Team work	Group classwork

C. Course Content

No	List of Topics	Contact Hours
1.	**Group Theory:** Review, Definition of Group, Subgroups, Cyclic Groups, Euler's theorem, Cosets, Lagrange's theorem, Normal Subgroups, quotient Groups.	**20**
2.	**Structures of groups:** Isomorphism Theorems, Conjugacy, Group acting on Sets, Finite Abelian Groups, Sylow Theorems, Examples of Simple Groups.	**15**
3.	**Rings:** Basic definitions and examples, Ring Homomorphisms, Ideals. Quotient Ring, Principal Ideal Domains, Euclidean Domains, Fields.	**20**
4.	**Polynomial rings:** Definitions and basic property, Polynomial Rings over fields. Irreducibility criteria.	**20**
Total		**75**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	*A First Course in Abstract Algebra*, **J. Farleigh, Pearson Education, 1st Indian edition, 2003. (Main Reference).**
Supportive References	*Abstract Algebra*, **D. Dummit, R. Foote, John Wiley, 3rd Edition, 2004.** *Contemporary Abstract Algebra*, **J. Gallian, Houghton Mifflin Company; 5th Edition, 2001.** *Abstract Algebra: An Introduction*, **T. Hungerford, Brooks Cole; 2nd Edition, 1996.**
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Classrooms:** Equipped with whiteboards, projectors, and Smart Boards for interactive lessons and group discussions. • **Laboratories:** Feature computers with internet access, enabling hands-on activities and exploration of algebraic and trigonometric concepts. • **Exhibition Rooms:** Spaces for showcasing projects and presentations to encourage collaborative learning.
Technology equipment (projector, smart board, software)	• **Data Show Projectors:** For clear presentations in classrooms and labs. • **Smart Boards:** To enhance interactivity during lessons. • **Mathematical Software:** Essential for graphing and analysis.
Other equipment (depending on the nature of the specialty)	• **Computers:** For mini-project and homework and practical applications in laboratories. • **Advanced Calculators:** For computations and problem-solving and supporting the study of limits, continuity, and differentiation. • **Whiteboards and Markers:** To facilitate brainstorming and collaboration.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student and teaching staff	Surveys and Questionnaires
Effectiveness of Students assessment	Course Coordinator	Peer Reviews
Quality of learning resources	Students and teaching staff	Classroom Observations
The extent to which CLOs have been achieved	Student Representatives	Student Performance Evaluations (exams, projects) CLOs Excel sheet.
Other	**None**	

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL**
REFERENCE NO.	**8/1446**
DATE	**05/04/1446 (08/10/2024)**