King Fahd University of Petroleum & Minerals
Department of Mathematics
MATH 323 Syllabus
Second Semester 2023-2024 (Term 232)
Instructor: Dr. Abdulaziz M. Alassaf
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Office Hours: 12:10 PM – 1:15 PM UTR

Course Code: Math 323
Course Title: Modern Algebra I
Textbook: Contemporary Abstract Algebra by J. A. Gallian, ninth edition (2016)
Description: Review of basic group theory including Lagrange's Theorem. Normal subgroups, factor groups, homomorphisms, fundamental theorem of finite Abelian groups. Examples and basic properties, integral domains and fields, ideal and factor rings, homomorphisms. Polynomials, factorization of polynomials over a field, factor rings of polynomials over a field. Irreducibles and unique factorization, principal ideal domains.
Prerequisite: Math 210 or ICS 253, ICS 254
Objective: This course is intended to introduce students to fundamental concepts and techniques in abstract algebra and to provide students with appropriate background for more advanced courses in mathematics.

Learning Outcomes:

Upon completion of this course, students should be able to
• Define normal subgroups, factor groups, homomorphisms
• Discuss the fundamental theorem of finite Abelian groups
• Explain integral domains and fields
• Define ideals, factor rings and ring homomorphisms
• Explain factorization of polynomials over a field, factor rings of polynomials over a field
• Define irreducible elements and unique factorization
• Discuss principal ideal domains

Grade Distribution

Exam 1:	18%	(Ch. 2 – Ch. 6, Monday, February 19, 2024)
Exam 2:	18%	(Ch. 7 – Ch. 11, Wednesday, March 13, 2024)
Exam 3:	18%	(Ch. 12 – Ch. 16, Wednesday, May 8, 2024)
Class work:	10%	(4 Quizzes)
Final Exam:	36%	(Comprehensive)

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will be reported to the higher university administration.

Cheating in exams includes (but not limited to):
➢ looking at the papers of other students
➢ talking to other students
➢ using mobiles or any other electronic devices.

Missing an Exam: In case a student misses an exam (Exam I, Exam II, Exam III or the Final Exam) for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get zero in the missed exam.

Attendance: Students are expected to attend all lecture classes.

➢ If a student misses a class, he/she is responsible for any announcement made in that class.

➢ A DN grade will be awarded to any student who accumulates more than 20% (09) unexcused absences or 33% (15) excused and unexcused absences.

Note: The student will be warned **twice** before he/she is assigned a DN grade

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must take permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin.

Course Plan

Week #	Date	Chapter	Topics
1	Jan. 14-18	2 3	Groups, Definitions, Examples, Elementary Properties Finite Groups, Subgroups: Terminology and notation, Subgroup Tests
2	Jan. 21-25	3 4	Examples of Subgroups Cyclic groups: Properties of Cyclic Groups
3	Jan. 28-Feb. 01	4 5	Classification of Subgroups of Cyclic Groups Permutation groups: Notation & Definition, Cycle notation
4	Feb. 04-08	5 6	Properties of Permutations Isomorphisms: Examples& Definition, Cayley's Theorem
5	Feb. 11-15	6 7	Properties of Isomorphisms, Automorphisms Cosets and Lagrange's theorem: Properties of Cosets, Lagrange's Theorem & Consequences
First Major Exam: Monday, February 19, 2024; Material: Ch. 2 – Ch. 6			
6	Feb. 18-21	8 9	External Direct Product: Definition, Examples, Properties of Ex. Dir. Prod. Normal subgroups and Factor groups: Normal Subgroups, Factor groups
Thursday, Feb. 22: Saudi Foundation Day Holiday			
7	Feb.25-29	9 10	Internal Direct Products Group Homomorphisms: Definition, Examples, Properties
8	Mar. 03-07	10 11	The First Isomorphism Theorem Fundamental Theorem of Finite Abelian Groups: The Fundamental Theorem, The Isomorphism Classes of Abelian Groups
Second Major Exam: Wednesday, March 13, 2024; Material: Ch. 7 – Ch. 11			
9	Mar. 10-14	12	Introduction to rings: Definition, Examples, Properties of Rings, Subrings
10	Mar. 17-21	13	Integral Domains: Definition, Examples, Fields, Characteristic of a Ring.
11	Mar. 24-28	14	Ideals and Factor Rings: Ideals, Factor Rings, Prime and Maximal Ideals.
Mar. 29 – Apr. 18: Eid Al-Fitr Holidays			
12	Apr. 21-25	15	Ring Homomorphism: Definition, Examples, Properties of Ring Homomorphisms, The Field of Quotients
13	Apr. 28-May 02	16	Polynomial Rings: Notation and Terminology, The Division Algorithm and Consequences.
Third Major Exam: Wednesday, May 8, 2024; Material: Ch. 12 – Ch. 16			
14	May 05-09	17	Factorization of Polynomials: Reducibility Tests, Irreducibility Tests, Unique Factorization in Z[x]
15	May 12-16	18	Divisibility in Integral Domains: Irreducibles, Primes, Unique Factorization Domains.
16	May 19	Catch-up	A Normal Thursday class