Department of Mathematics—Philadelphia University

Course Syllabus

Course Title	Abstract Algebra 2
Course Code	250442
Semester	First/2022–2023
Lecturer	Amin Witno
Office Room	814 Faculty of Science
Office Hours	Sun/Tue: 09:30–11:00; Mon/Wed: 11:00–12:30
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Short Description

This module is the second half of the undergraduate Abstract Algebra series, covering topics in rings and fields: integral domains, polynomial rings, field extensions, finite fields, and a brief coverage of Galois theory, if time permits.

Topics by the Week

1. Review of Group Theory
2. Introduction to rings and subrings, basic properties of rings, the subring test
3. Integral domains, zero divisors and unit elements, fields, the subfield test
4. Ideal, the ideal test, principal ideal domains
5. Factor rings, prime ideals and maximal ideals
6. Ring homomorphism, the fundamental homomorphism theorem for rings, the Chinese remainder theorem
7. The ring of polynomials over an integral domain
8. Divisibility theory in a polynomial ring over a field, the division algorithm, greatest common divisor
9. Irreducible polynomials over a field, unique factorization of polynomials in F[x], irreducibility tests over Q
10. Minimal polynomials of algebraic elements over a field, field extensions, splitting fields
11. The characteristic of a field, classification of finite fields, the subfield lattice
12. Introduction to cyclotomic fields, irreducibility of the cyclotomic polynomials over Q
13. Degree of a finite extension, algebraic field extensions
14. Some applications in classical geometry: geometric constructions, constructable numbers, regular polygons

Lecture Notes

The revision notes titled *From Groups to Galois* are required. Students can download a softcopy of these notes for free from the online course page. We will cover Chapters 14 to 26; Students who wish to review lessons from group theory are suggested to read the first 13 chapters.

The above materials can be obtained via the link below.

https://www.philadelphia.edu.jo/academics/awitno

Recommended Textbook

Students who wish to consult an Abstract Algebra textbook can do so by visiting our main library. The following titles are highly recommended.

1. Joseph A. Gallian, Contemporary Abstract Algebra, Tenth Edition 2021, CRC Press.
2. I. N. Herstein, Topics in Algebra, Second Edition 1975, Wiley.

Online Resources

The following shortcut will take you to my web homepage at the University, where you find the course syllabus, exam dates, copies of old exams, links to the above materials, and any important announcement related to the current semester.

http://phi.witno.com

Grade Distribution

The following guideline is tentative; it may be modified as necessary according to the University directive for the current semester.

Homeworks Quizzes Class participation	30%
Midterm Exam	30%
Final Exam	40%

Exam Dates

Exam dates, once determined, will be posted online at the homepage as well as at the University student-portal page.

Homework Sets

Homework problem sets with check answers can be downloaded also from the above homepage.

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