MA268-10 Algebra 3

24/25

Department
Warwick Mathematics Institute
Level
Undergraduate Level 2
Module leader
Samir Siksek
Credit value
10
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This is a second abstract algebra module for Mathematics students.

Module web page

Module aims

This is a second course on groups, rings and fields that delves deeper into those topics. We aim to attain a better understanding of groups both as abstract objects and through their actions on sets. We also want to understand how unique factorization can be generalized in rings that have a Euclidean algorithm.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Group Theory: quaternionic group, matrix group, coset, Lagrange's theorem, quotient group, isomorphism theorem, free group, group given by generators and relations, group action, G-set G/H, orbit, stabiliser, the orbit-stabiliser theorem, conjugacy class, classes in S_n,

classification of groups up to order 8.
- Ring Theory: domain, isomorphism theorem, Chinese remainder theorem for Z/nZ and F[x]/(f), unit group, prime and irreducible element, factorization, Euclidean domain, characteristic of a field, unique factorization domain, ED is UFD, finite subgroup of units in fields.
- Module Theory: module, free module, internal and external direct sum, free abelian group, unimodular Smith normal form, the fundamental theorem of finitely generated abelian groups.
- List of covered algebraic definitions: direct product, coset, normal subgroup, quotient group, ideal, quotient ring, domain, irreducible element, prime element, euclidean domain, unique factorisation domain, direct product, free group, generators and relations, module, free module, direct sum, unimodular Smith normal form, action, orbit, stabiliser, fixed points.

Learning outcomes

By the end of the module, students should be able to:

- have a working knowledge of the main constructions and concepts of theories of groups and rings
- recognise, classify and construct examples of groups and rings with specified properties by applying the algebraic concepts

Indicative reading list

Ronald Solomon, Abstract Algebra, Brooks/Cole, 2003.
Niels Lauritzen, Concrete Abstract Algebra, Cambridge University Press, 2003
John B. Fraleigh, A first course in abstract algebra, Pearson, 2002
Joseph A. Gallian, Contemporary Abstract Algebra, Cengage Learning, 2012

View reading list on Talis Aspire

Subject specific skills

Students will improve their skills in thinking algebraically in a variety of settings. This includes working with axiomatic definitions of algebraic objects and analysing the structure and relationships between algebraic objects using fundamental tools such as subobjects and homomorphisms, laying a foundation for future study in algebra, number theory and algebraic geometry.

Transferable skills

The module emphasises the power of generalisation and abstraction. Students will improve their ability to analyse abstract concepts and to solve problems by selecting and applying appropriate abstract tools.

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (30%)
Seminars	9 sessions of 1 hour (9%)
Private study	61 hours (61%)
Total	100 hours

Private study description

Working on assignments, going over lecture notes, text books, exam revision.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time	Eligible for self-certification
Assignments	15%		No
Examination	85%		No

- Answerbook Pink (12 page)

Assessment group R1

	Weighting	Study time	Eligible for self-certification
In-person Examination - Resit	100%		No

- Answerbook Pink (12 page)

Feedback on assessment

Marked homework (both assessed and formative) is returned and discussed in smaller classes.

Exam feedback is given.

Past exam papers for MA268

Availability

Courses

This module is Core for:

- Year 2 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- Year 2 of UMAA-G100 Undergraduate Mathematics (BSc)
- UMAA-G103 Undergraduate Mathematics (MMath)
    - Year 2 of G100 Mathematics
    - Year 2 of G103 Mathematics (MMath)
- Year 2 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 2 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- Year 2 of UMAA-G101 Undergraduate Mathematics with Intercalated Year

This module is Option list A for:

- Year 2 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 2 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)

This module is Option list B for:

- Year 2 of UCSA-G4G1 Undergraduate Discrete Mathematics
- Year 2 of UCSA-G4G3 Undergraduate Discrete Mathematics
- Year 2 of UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)