

School of Mathematical Sciences
PURE MTH 3007
Groups and Rings III, Semester 1, 2010

Information about the course

1. Description: The algebraic notions of groups and rings are of great interest in their own right, but knowledge and understanding of them is of benefit well beyond the realms of pure algebra. Areas of application include, for example, advanced number theory; cryptography; coding theory; differential, finite and algebraic geometry; algebraic topology; representation theory and harmonic analysis including Fourier series. The theory also has many practical applications including, for example, to the structure of molecules, crystallography and elementary particle physics.

2. Graduate attributes: 1, 2, 3, 4, 5, 6.

3. Objectives: To introduce students to the basic ideas and methods of modern algebra. At the end of this course students should be able to understand the idea of a group, a ring and an integral domain, and be aware of examples of these structures in mathematics; appreciate and be able to prove the basic results of group theory and ring theory; understand and be able to apply the fundamental theorem of finite abelian groups; understand Sylow's theorems and be able to apply them to prove elementary results about finite groups; appreciate the significance of unique factorization in rings and integral domains.

4. Content: Topics covered are: (1) Groups, subgroups, cosets and normal subgroups, homomorphisms and factor groups, products of groups, finitely generated abelian groups, groups acting on sets and the Sylow theorems. (2) Rings, integral domains and fields, polynomials, ideals, factorization in integral domains and unique factorization domains.

5. Linkage: Prerequisite is MATHS 1007A/B Mathematics I (Pass Div I) or both MATHS 1007A/B Mathematics I (Pass Div II) and MATHS 2004 Mathematics IIM (Pass Div I). PURE MTH 2002 Algebra II is assumed knowledge but the necessary material is revised at the start of the course.

This course is not a prerequisite for any specific course, but is a recommended course for students intending to take Honours Pure Mathematics. This course also provides a useful background for PURE MTH 3012 Fields and Geometry III.

6. Recommended text: *A First Course in Abstract Algebra*, J.B. Fraleigh.

7. Lectures: There are three lectures a week: Monday 2.10 in Physics 103 (Kerr Grant), Tuesday 1.10 and Thursday 2.10 in Napier G03. In odd weeks the Wednesday lecture will be a tutorial / problem class.

8. Assessment: The final grade will be made up of a 3 hour exam worth 70%, class exercises worth 15% and a short mid-term worth 15%. The mid-term will be held during the lecture time on Monday 26th of April.

9. Supplementary Examinations: See the University policy here: <http://www.adelaide.edu.au/student/exams/supps.html>.

10. Plagiarism: Please sign and return the plagiarism form when you hand in Class Exercise 1. This form will cover all the assignments in the course.

11. Course web site: I will put general course information, weekly summaries and copies of handouts, assignments etc on the course web site at <http://www.maths.adelaide.edu.au/michael.murray/gr10/gr10.html>. There is a link on the myUni web page to the course web page.

12. Contact details: You can find me on Level 4 of 10 Pulteney St in Room 419. The phone there is 8303 4174 and my email is michael.murray@adelaide.edu.au.

Professor Michael Murray
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