



MATH20201 - 2012/2013

General Information

- Title: Algebraic Structures 1
- Unit code: MATH20201
- Credit rating: 10
- Level: 2
- Pre-requisite units: MATH10101 or MATH10111, MATH10202 or MATH10212
- Co-requisite units:
- School responsible: Mathematics
- Members of staff responsible: Prof. A. Premet

Unit specification

Aims

The programme unit aims to introduce basic ideas group theory with a good range of examples so that the student has some familiarity with the fundamental concepts of abstract algebra and a good grounding for further study.

Brief description

This course unit provides an introduction to groups, one of the most important algebraic structures. It gives the main definitions, some basic results and a wide range of examples. This builds on the study of topics such as properties of the integers, modular arithmetic, and permutations included in MATH10101/MATH10111. Groups are a fundamental concept in mathematics, particularly in the study of symmetry and of number theory.

Intended learning outcomes

On completion of this unit successful students will be able to:

- Appreciate and use the basic definitions and properties of groups;
- Command a good understanding of the basic properties for a good range of examples;
- Understand and find simple proofs of results in group theory.

Future topics requiring this course unit

This is followed by the Semester 2 unit MATH20212 *Algebraic Structures 2* that focuses on rings. Together these units provide the basis for a wide range of modules in algebra and related areas at levels 3 and 4. The ideas developed in this lecture course are also used in analysis, geometry, number theory and topology.

Syllabus

1. **Binary operations.** Multiplication tables, associativity, commutativity, associative powers. [2 lectures]

2. **Groups.** Definitions and examples (groups of numbers, the integers modulo n , symmetric groups, groups of matrices). [2]
3. **Subgroups.** Subgroup criterion, cyclic subgroups, centralizer, centre, order of an element. [4]
4. **Cyclic groups.** Subgroups of cyclic groups are cyclic, subgroups of finite cyclic groups. [1]
5. **Cosets and Lagrange's Theorem.** [2]
6. **Homomorphisms and isomorphisms.** Definition and examples, group theoretic properties. [2]
7. **Conjugacy.** Conjugacy classes, conjugacy in symmetric groups, the class formula. [4]
8. **Normal subgroups.** [2]
9. **Factor groups.** [2]
10. **The First Isomorphism Theorem** [1]

Textbooks

- John B. Fraleigh, *A First Course in Abstract Algebra*, Addison-Wesley

Learning and teaching processes

Two lectures and one examples class each week. In addition students should expect to do at least four hours private study each week for this course unit.

Assessment

Coursework; An in-class test, weighting within unit 20%

2 hours end of semester examination; Weighting within unit 80%

Arrangements
