

On-line course materials

# MATH20201 - Algebraic Structures 1

Year: 2 - Semester: 1 - Credit Rating: 10

## Requisites

### *Prerequisites*

MATH10101 Sets, Numbers and Functions A

MATH10111 Sets, Numbers and Functions B

## Aims

The course 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.

## 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.

## Syllabus

- **Binary operations.** Multiplication tables, associativity, commutativity, associative powers. [2 lectures]
- **Groups.** Definitions and examples (groups of numbers, the integers modulo  $n$ , symmetric groups, groups of matrices). [2]

- **Subgroups.** Subgroup criterion, cyclic subgroups, centralizer, centre, order of an element. [4]
- **Cyclic groups.** Subgroups of cyclic groups are cyclic, subgroups of finite cyclic groups. [1]
- **Cosets and Lagrange's Theorem.** [2]
- **Homomorphisms and isomorphisms.** Definition and examples, group theoretic properties. [2]
- **Conjugacy.** Conjugacy classes, conjugacy in symmetric groups, the class formula. [4]
- **Normal subgroups.** [2]
- **Factor groups.** [2]
- **The First Isomorphism Theorem** [1]

## Teaching & Learning Process (Hours Allocated To)

Lectures	Tutorials/ Example Classes	Practical Work/ Laboratory	Private Study	Total
33	0	0	67	100

## Assessment and Feedback

- Coursework; An in-class test, weighting within unit 20%
- 2 hours end of semester examination; Weighting within unit 80%

## Further Reading

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

## Staff Involved

Prof Ralph Stohr - Lecturer

Data source is EPS system

*Back To Top*