On-line course materials

MATH32001 - Group Theory

Year: 3 - **Semester:** 1 - **Credit Rating:** 10

Requisites

Prerequisites
MATH20212 Algebraic Structures 2

Aims

This lecture course unit aims to introduce students to some more sophisticated concepts and results of group theory as an essential part of general mathematical culture and as a basis for further study of more advanced mathematics.

Brief Description

The ideal aim of Group Theory is the classification of all groups (up to isomorphism). It will be shown that this goal can be achieved for finitely generated abelian groups. In general, however, there is no hope of a similar result as the situation is far too complex, even for finite groups. Still, since groups are of great importance for the whole of mathematics, there is a highly developed theory of outstanding beauty. It takes just three simple axioms to define a group, and it is fascinating how much can be deduced from so little. The course is devoted to some of the basic concepts and results of Group Theory.

Learning Outcomes

On successful completion of this course unit students will have acquired

- a sound understanding of the classification of finitely generated abelian groups,
- knowledge of some fundamental results and techniques from the theory of finite groups,
- knowledge of group actions on sets, simple groups, Sylow's theorems and various applications of Sylow's theorems.

Syllabus

- Revision of basic notions (subgroups and factor groups, homomorphisms and isomorphisms), generating sets, commutator subgroups. [2 lectures]

- Abelian groups, the Fundamental Theorem on finitely generated abelian groups. [4]
- The Isomorphism Theorems. [3]
- Simple groups, the simplicity of the alternating groups. [3]
- Composition series, the Jordan-Hlder Theorem. [2]
- Group actions on sets, orbits, stabilizers, the number of elements in an orbit, Burnside's formula for the number of orbits, conjugation actions, centralizers and normalizers. [5]
- Sylow's Theorems, groups of order pq, pqr. [3]

Teaching & Learning Process (Hours Allocated To)

Lectures	Tutorials/ Example Classes	Practical Work/ Laboratory	Private Study	Total
22	11	0	67	100

Assessment and Feedback

- Coursework: in-class test weighting 10%
- End of semester examination: two hours, weighting 90%

Further Reading

Recommended text:

John B Fraleigh, A First Course in Abstract Algebra, (5th edition), 1967, Addison-Wesley.

Staff Involved

Prof Peter Rowley - Lecturer

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