MATH 3015 GROUPS AND SYMMETRY

Teaching Periods

Credit Points 10

Legacy Code 301376

Coordinator Roozbeh Hazrat (https://directory.westernsydney.edu.au/search/name/Roozbeh Hazrat/)

Description This unit develops abstract algebraic thinking to a higher level. The abstract concepts introduced in the unit, the theory of groups and abstract symmetry, have many applications in science and technology. Symmetry plays a role in many different contexts: in crystals, in visual arts, in music and in architecture, to name a few. Analysing and exploiting the symmetries of a particular problem often is the first step towards finding a practical solution to the problem. Group theory is the study of symmetry. This unit develops the language of groups and techniques to understand the structure of groups.

School Computer, Data & Math Sciences

Discipline Mathematics

Student Contribution Band HECS Band 1 10cp

Check your HECS Band contribution amount via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 3 subject

Pre-requisite(s) MATH 1006

Equivalent Subjects MATH 3001 Abstract Algebra

Assumed Knowledge

Logic, proof techniques: direct proof, proof by division into cases, proof by contradiction, proof by induction.

Learning Outcomes

On successful completion of this subject, students should be able to:
1. Apply fundamental structures in abstract algebra: groups, subgroups, and permutation groups.
2. Apply concepts from group theory to the study of the symmetry of objects, such as polygons.
3. Formulate proofs involving groups, subgroups, and permutation groups.
4. Communicate mathematical arguments effectively in both spoken and written format.

Subject Content

- Sets and equivalence relations
- Introduction to groups
- Examples of groups and basic properties of groups
- Finite groups and subgroups
- Cyclic groups
- Permutation groups
- Cosets and Lagrange?fs Theorem
- Normal subgroups and factor groups
- Group homomorphisms and group isomorphisms
- Cayley graphs of groups
- Applications of groups