

MATH-211 - Algebra II: Groups

This course deals with the theory of groups (see the week-by-week list of topics at the end of this document).

Time and place

- Lecture: Fridays 8:15 - 10:00 in CM5
- Exercise Session: Fridays 10:15 - 12:00 (location depends on your TA)

Instructors

- Lecturer: Andrei Negut
- Teaching Assistants: Archi Kaushik, Virgile Simon Constantin,
Patrick-Cristian Dan, Claudio Pfammatter

Grading: Written final exam (winter session)

Moodle: <https://go.epfl.ch/MATH-211>

Textbooks: Lecture notes will be provided; for additional help, we suggest

- D. S. Dummit, R. M. Foote, "Abstract algebra, 3rd edition"
- J. J. Rotman, "An introduction to the Theory of Groups"

Logistics: Every week before class, you may find on Moodle

- the lecture notes for the upcoming class
- the sheet to be used in the upcoming exercise sessions
- several bonus problems, which you are encouraged to solve on your own

Note: the bonus problems will not be graded, but they are great exam practice. We strongly recommend you “turn them in” on the Forum in Moodle (you may post anonymously or under your own name). This is meant to start conversations between students and instructors, so everyone benefits. Feel free to ask both about the correctness of arguments, ask about how well your solutions are written up, and also answer your classmates’ questions.

Language: English, but we will provide (unofficial) translations of all course materials in French. In case of doubt, the English version takes precedence.

List of topics (subject to slight changes):

1. (Sep 13): Groups and actions, homomorphisms
2. (Sep 20): Subgroups, orbits, stabilizers, conjugacy classes, orders
3. (Sep 27): Normal subgroups, centralizers, normalizers,
the isomorphism theorems
4. (Oct 4): Short exact sequences, direct and semidirect products
5. (Oct 11): Abelian groups, torsion, finite generation
6. (Oct 18): Classification of finitely generated abelian groups
7. (Nov 1): Simple groups, composition series, the Jordan-Hölder theorem
8. (Nov 8): Solvable groups, derived subgroups, nilpotent groups
9. (Nov 15): Sylow p -subgroups and the Sylow theorems
10. (Nov 22): Application: classifying groups of small order
11. (Nov 29): Classification of finite nilpotent groups
12. (Dec 6): Free groups, generators and relations
13. (Dec 13): Elements of representation theory
14. (Dec 20): Elements of category theory