

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: Wednesdays 8:15 - 10:00 in SG 0211
- Exercise Session: Wednesdays 10:15 - 12:00 (location depends on your TA, and will be announced on Moodle)

Instructors

- Lecturer: Andrei Negut
- Teaching Assistants: Archi Kaushik, August Hassan Bohme, Virgile Constantin, Patrick-Cristian Dan, Yang Zhang

Grading: Written final exam (winter session)

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

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.

Important: attending the lectures, participating in the exercise sessions, and studying the lecture notes are all mandatory parts of the class.

List of topics:

1. (Sep 10): Groups and actions, homomorphisms
2. (Sep 17): Subgroups, orbits, stabilizers, conjugacy classes, orders
3. (Sep 24): Normal subgroups, centralizers, normalizers, the isomorphism theorems
4. (Oct 1): Short exact sequences, direct and semidirect products
5. (Oct 8): Abelian groups, torsion, finite generation
6. (Oct 15): Classification of finitely generated abelian groups
7. (Oct 29): Simple groups, composition series, the Jordan-Hölder theorem
8. (Nov 5): Solvable groups, derived subgroups, nilpotent groups
9. (Nov 12): Sylow p -subgroups and the Sylow theorems
10. (Nov 19): Application: classifying groups of small order
11. (Nov 26): Classification of finite nilpotent groups
12. (Dec 3): Free groups, generators and relations
13. (Dec 10): Elements of category theory
14. (Dec 17): Elements of representation theory

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

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"