Math 514a
Algebraic number theory (first semester)
Fall 2025

Instructor: Prof. Anna Medvedovsky
Email: medved@arizona.edu
Office: ENR2 S360

Website: https://math.arizona.edu/~medved/Teach/ANTF2025/Land.html
All course information (homework, updated office hours) posted here.

Lecture: TΘ 11am–12:15pm in Math Tower 514 (*sic*!)

Office hours: T 4–5pm and Θ 2:30–4:30pm
(Office hours times will need to change if there's a Thursday colloquium.)

Zoom info: https://arizona.zoom.us/my/medved (meeting ID: 748 818 0837)
(The course has no regular Zoom component, to be used only as necessary.)

Course goals
This is a first-semester course on algebraic number theory. We will discuss global fields (rings of integers in number fields, unique factorization of ideals in general Dedekind domains, prime splitting in extensions of number field, unit groups, class groups), geometric methods (the Dirichlet Unit Theorem, the finiteness of class groups), the theory of local fields (both in their own right and as completions of number fields), analytic methods and density theorems, and (time permitting) infinite Galois theory followed by the statements of class field theory.

Prerequisites: Students should be familiar with the language of abstract algebra, ideally at the level of the core graduate algebra course, including the concepts of groups, rings, fields, ideals, modules, PIDs, UFDs, noetherian rings, localization, finite Galois theory, finite fields. Additionally it will be helpful to be familiar with topological groups and complex-analytic functions.

Textbooks: There is no required textbook for the course, but the following algebraic number theory texts may be helpful:

- Janusz, *Algebraic Number Fields*
- Marcus, *Number Fields*
- Milne, *Algebraic Number Theory*

Additionally, the following may be helpful as reference: Introduction to commutative algebra (Atiyah and Macdonald), Algebra (Dummit and Foote) or a similar graduate algebra text, Keith Conrad's blurbs.

Homework: Expect homework sets every 1–2 weeks.

Optional project: Students will have the opportunity to write a short expository paper on a related topic not directly covered in the course and give a 30-minute in-class presentation. Suggested topics will be distributed at the beginning of October.

Grading policy: Grades will be determined based on participation, homework assignments, and the optional project. The grading scale will be no less generous than 60% for an A, 50% for a B, 40% for a C.

Introductory meeting: A requirement of the course is to meet with me one-on-one for about 10–20 minutes during the first three weeks of the semester.

Phone/tablet/laptop policy: Cell phones should be away and completely silent during class. No laptops in general (exception: if you take notes e.g. by live-TeXing on a laptop, come talk to me). Lie-flat tablets are permitted for note-taking and consulting course materials only. In particular, if you're having an emergency and need to send an email or take a call during class, please step out of the classroom.

Accommodations: If there is something that would help make this course a successful learning experience for you, please come discuss it with me!

Additional university-mandated syllabus points

- **Syllabus adjustments:** Other than the grade and absence policies, this syllabus may be subject to change with reasonable advance notice.
- **Attendance:** Absences for any sincerely held religious belief, observance, or practice will be accommodated where reasonable. Absences pre-approved by the University Dean of Students will be honored.
- Link to **Threatening behavior by students policy**. Don't, please.
- Link to **Student code of academic integrity**. It goes without saying that plagiarism is unacceptable student behavior. Any work you turn in should be your own. This includes using generative AI to do homework problems!
- **Accessibility and accommodations:** If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, `https://drc.arizona.edu/`) to establish reasonable accommodations.