

**MATH 4306A / MATH 5306W ALGEBRAIC NUMBER THEORY, WINTER 2022**  
(Tentative course outline, subject to change, updated January 1, 2022)

**Instructor:** Şaban Alaca

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**Calendar description:** Algebraic number fields, bases, algebraic integers, integral bases, arithmetic in algebraic number fields, ideal theory, class number.

**Prerequisite:** MATH 3158 or permission of the School

**Lectures (online via Zoom):** Tuesdays and Thursdays 10:05–11:25 am  
Lectures begin on Tuesday January 11, 2022, and end on Tuesday April 12, 2022.

**Office hours (online via Zoom):** Tuesdays and Thursdays 11:25–11:55 am

**Grading scheme:**

1. **Assignments (40%):** There will be four assignments to be handed in during the term. The questions may require computation using a scientific calculator or mathematical software.
2. **Final exam (60%):** There will be a take-home final exam, details of which will be announced in class. The exam will be during the university's final examination period.

**Textbook:** Introductory Algebraic Number Theory, by Ş. Alaca and K. S. Williams, Cambridge University Press. Free online access is available through the university library.

A selection of topics from the following chapters of the textbook will be covered:

**Chapters 1, 2 and 3:** Review of Integral Domains, Euclidean Domains and Noetherian Domains

**Chapter 4:** Elements Integral over a Domain

**Chapter 5:** Algebraic Extensions of a Field

**Chapter 6:** Algebraic Number Fields

**Chapter 7:** Integral Bases

**Chapter 8:** Dedekind Domains

**Chapter 9:** Norms of Ideals

**Chapter 10:** Factoring Primes in a Number Field

**Chapter 11:** Units in Real Quadratic Fields

**Chapter 12:** The Ideal Class Group

**Chapter 14:** Applications to Diophantine Equations

**Email communication with instructor:** As per university policy, please use your Carleton e-mail account for all course-related emails.

**Announcements:** You are responsible for keeping up with information announced during the lectures and tutorials, or sent to your Carleton e-mail account, or announced on Brightspace.

**Academic accommodations for students with disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or <https://carleton.ca/pmc/> for a formal evaluation. If you are already registered with PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled assessment requiring accommodation. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. For the deadline to request accommodations for formally-scheduled exams, visit the PMC website at <https://carleton.ca/pmc/>

**Academic accommodations for religious obligations and/or pregnancy:** Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the student guide at <https://carleton.ca/equity/accommodation/academic/students/>