

# PMATH441/741 ALGEBRAIC NUMBER THEORY

Winter 2025

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<b>Instructor:</b>	Chatchai Noytaptim	<b>Email:</b>	<a href="mailto:cnoytapt@uwaterloo.ca">cnoytapt@uwaterloo.ca</a>
<b>Office Hour:</b>	TBD	<b>Location:</b>	MC 5407

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**Lecture sessions:** We will meet regularly on MWF (3.30PM-4.20PM) at RCH 305.

**Office Hours:** Weekly office hour will be held at MC 5407 (schedule is TBD), or by appointment.

**Textbook:** There is no required main textbook for this course. However, I will follow closely the first three chapters of the following course notes:

- Matthew Baker, *Algebraic Number Theory Course Notes*, Revised version on February 23, 2022.

I will also have my typed notes posted on Learn site regularly before sessions and updated after based on discussion in classes. I strongly encourage you skimming through the notes before coming to classes. The attendance will not be marked, but it is highly recommended to attend lecture sessions.

**Course Description:** An introduction to algebraic number theory; unique factorization, Dedekind domains, class numbers, Dirichlet's unit theorem, solutions of Diophantine equations.

## Topics covered:

- Rings of integers, Dedekind domains, and unique factorization of ideals
- The ideal class group
- Computing the ring of integers in number field
- Kummer's theorem on factoring ideals
- The Splitting of primes
- Cyclotomic Fields
- Minkowski's geometry of numbers
- Dirichlet's Unit Theorem

**Grading Policy:** The marking scheme for the course will be as follows:

	PMATH441	PMATH741
Written Assignments	70%	70%
Midterm Exam	15%	10%
Final Exam	15%	10%
Presentation	N/A	10%

**Important notes:**

- **Exams:** Both Midterm exam and Final exam are held in classes. Tentatively, the midterm exam will be held on February 19, 2025 and the Final exam will be held on April 2, 2025. I plan to have both exams are open book. However, all electronic devices and calculators are **prohibited**.
- **Assignments:** There will be roughly 10 written assignments. Written assignments will be submitted through Crowdmark which will be typically due on Friday. Late submission is not accepted. If you missed the deadline or you are not able to complete the assignments within due date, you must contact me immediately. This process must be done before a suggested solution will be posted on Learn site. In addition to written assignments, I will also have extra practice problems which I will regularly add to a file on Learn throughout the term. These practice problems will not be required to hand in.
- **Presentation:** Students who take PMATH741 are asked to choose one question from practice problems to give a short presentation at some point towards the end of the term.
- **Regrade request:** If you feel there has been an error in the marking of your written assignment or exam, you have one week from the time you receive your graded work to request a regrade. Your regrade request should be directed to the instructor, and should include the question(s) you would like regraded as well as a brief justification as to why you believe a regrade is necessary. Regrade requests received after one week has elapsed will not be considered.

**Administrative Policy/ University Policy:**

**Academic integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](#) for more information.]

**Grievance:** A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

**Discipline:** A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](#) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

**Appeals:** A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](#).

**Note for students with disabilities:** [AccessAbility Services](#), located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.