MATH 415, Section 502
Modern Algebra I
Fall 2022

Instructor: Yaroslav Vorobets
Time: TR 2:20 – 3:35 p.m.
Location: BLOC 163
Web page: `http://www.math.tamu.edu/~yvorobet/MATH415/`

Office: BLOC 301b (email: `yvorobets@tamu.edu`).

Office hours: TR 11:00 a.m. – 12:00 p.m. (in person), W 5:00 – 6:00 p.m. (via ZOOM), and by appointment.

Text: J. B. Fraleigh, N. E. Brand, *A First Course in Abstract Algebra*, 8th ed., Pearson, 2020.

Prerequisites: MATH 300 (foundations of mathematics); MATH 304, 309, 311 or 323 (linear algebra).

Grading system: There will be weekly homework, two in-class exams and the final comprehensive exam. The midterm exams are worth 100 points (or 22.2% of the final grade) each, the final exam is worth 150 points (or 33.3% of the final grade). Extra credit can be earned by solving bonus problems on exams. The homework will account for another 100 points (or 22.2% of the final grade). The final grades will be assigned according to the 90–80–70–60% scale, that is, A for 405+ pts, B for 360–404 pts, C for 315–359 pts, D for 270–314 pts, and F for less than 270 pts.

The *tentative* dates for the midterms are October 6 and November 10. The final exam is scheduled for Wednesday, December 14, 1:00 – 3:00 p.m.

The homework assignments should be submitted through Gradescope (via Canvas). Late submissions may be penalized if circumstances warrant.

Make-ups: Make-ups for missed exams will only be allowed for a university approved excuse in writing. Wherever possible, inform the instructor before an exam is missed. Consistent with University Student Rules, students are required to notify the instructor by the end of the next working day after missing an exam. Otherwise, they forfeit their rights to a make-up.

Academic integrity: Although students are encouraged to discuss homework problems, each student is expected to write his/her own solutions. Copying another student's work is dishonest and academically worthless. Information about the Honor Council Rules and Procedures can be found at `http://aggiehonor.tamu.edu/`

Copyright notice: All course materials (both printed and web-based) are protected by U.S. Copyright Laws. No multiple copies can be made without written permission by the instructor.

Students with disabilities: If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845–1637 (or visit `http://disability.tamu.edu`). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and limits to confidentiality: Class materials are generally considered confidential pursuant to student record policies and laws. As a University employee, I, however, must report allegations of sexual assault, sexual discrimination, or sexual harassment when they involve TAMU students, faculty, or staff, or third parties visiting campus if you share such information with me.

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Course content: This is a first course in abstract algebra. A study of groups, rings, fields with emphasis on the theoretical aspects and proofs.

Course outline

Part I ($\approx$ 3.5 weeks): *Basic group theory*

- Preliminaries from set theory
- Binary operations
- Groups, semigroups
- Subgroups, cyclic groups
- Groups of permutations
- Cosets, Lagrange's theorem

Fraleigh/Brand: Chapters I and II

Part II ($\approx$ 3.5 weeks): *More advanced group theory*

- Direct product of groups
- Factor groups
- Homomorphisms of groups
- Classification of abelian groups
- Group actions

Fraleigh/Brand: Chapters II and III

Part III ($\approx$ 4 weeks): *Basic theory of rings and fields*

- Rings and fields
- Integral domains
- Modular arithmetic
- Rings of polynomials
- Factorization of polynomials

Fraleigh/Brand: Chapters V and VI

Part IV ($\approx$ 3 weeks): *More advanced ring theory*

- Ideals
- Factor rings
- Homomorphisms of rings
- Prime and maximal ideals
- Factorization in integral domains
- Euclidean algorithm

Fraleigh/Brand: Chapter VI