TENTATIVE
MATH 632: Algebra II

MWF 9:15-10:15
Chapman 206
https://eallman.github.io/classes/632/632_2019.html

Instructor: Elizabeth S. Allman, Chapman 308B, e.allman@alaska.edu and 474-2479.

Office Hours: M 8:00 - 9:00, W 10:30 - 11:30, F problem session and by appointment. These office hours may change at a later date, depending on student demand and scheduling concerns. Please note that the best way to reach me is by e-mail.

Prerequisites: a graduate course in Abstract Algebra

Textbook: *Number Fields* by Daniel Marcus

Grading: There will be one midterm and a cumulative final exam. See details below. Grades will be assigned using the following weights:

Homework	35 %
Midterm	30 %
Final Exam	35 %

The midterm is tentatively scheduled for the week of March 18-22. The final exam will take place as published in the schedule of courses on Wednesday, May 1 from 8:00 - 10:00. Makeup exams will not be given.

Content: Broadly speaking, Number Theory is concerned with properties of the integers $\mathbb{Z}$ including prime factorization and solving Diophantine equations. There exist generalizations of the ring of integers in *number fields*, that is, finite dimensional field extensions of the rational numbers $\mathbb{Q}$, and we will study such *ring of integers* $\mathcal{O}$. This includes understanding whether such ring of integers are PIDs or not, and studying the factorization of prime ideals in $\mathcal{O}$. We will follow the textbook closely, since it gives an excellent exposition of algebraic number theory. Fortuituously, Appendix 2 in the textbook gives a brief and excellent survey of Galois theory over subfields of the complex numbers which we need for some of the later chapters in Marcus' book. We will use Dummit and Foote as necessary, if students find this appendix too concise.

Course Logistics: MATH 632 is a three hour graduate elective course. Ideally, we will find a fourth hour where we can meet to discuss problems on the weekly assignment. The time of this fourth hour would be spent similar to how it was spent in the core course MATH 631. That is, the goal is to come together as a group to discuss problems. Even if you can do all the problems yourself, this is a valuable exercise and one important goal for any graduate student in mathematics is to become comfortable and good at communicating orally mathematical arguments.

In class, lectures will highlight the main ideas and theorems for the topic under study, and will provide insight for good ways to think about objects or why these algebraic structures are so interesting. One of the most important skills to learn in a beginning graduate mathematics class is the ability to write cogent proofs and to give convincing arguments for theorems. Homework will be assigned regularly and collected once a week, typically on Monday at the

beginning of class. Please feel free to work with other students to discuss ideas for proofs, but your write-up should be completely your own. One goal for this course is for you to develop an independent and mature sense of when you have given a correct and well-written proof of a theorem.

Homework: Homework will be assessed in two ways this term. First, I will collect a (LaTeX-ed) homework assignment from each student at the beginning of class on its due date. A small number of problems from each assignment will be graded to give personalized feedback to students. Separately, I will collect a few solutions from each student. These solutions should be a separate LaTeX file deposited in a class directory and a template will be made available. These solutions will be collated and used both for my review and at times for *peer review* of proof writing. Of course, they will be marked for correctness too, and the marked assignment will be made available online. Students who took MATH 631 should be familiar with this protocol.

Course Outline:

We will work through Marcus' book starting on chapter 1 and then learn some Galois theory (Appendix 2). The pace of the course will be determined somewhat by the students, but ideally we will cover Chapters 1-5. (This is pretty ambitious, but maybe we can do even more.) The problems, and by this I mean *all* the problems, are an essential part of the text and we will most likely do them all.

Other Policies:

Course accommodations: If you need course adaptations or accommodations because of a disability, please inform your instructor during the first week of the semester, after consulting with the Office of Disability Services, 203 Whitaker (474-7403).

University and Department Policies: Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incompletes, late withdrawals, and early final exams, some of which are listed below. A complete listing can be found at

`https://www.uaf.edu/dms/policies/`.

Prerequisites: The prerequisite for MATH 632 is a graduate course in Abstract Algebra.

Late Withdrawal: This semester the last day for withdrawing with a 'W' appearing on your transcript is Friday, March 29. If, in my opinion, a student is not participating adequately in the class, I may elect to drop this student.

Graded Coursework: Please keep all graded work for MATH 632 until final grades have been assigned.

Academic Honesty: Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.

Grade Bands: A, A- (90 - 100%), B+, B, B- (80 - 89%), C+, C, C- (70 - 79%), D+, D, D- (60 - 69%), F (0 - 59%). On rare occasion, I may lower the thresholds. Also, in an effort to reward the student who makes significant improvement over the course of the term, a stellar grade on the final may overcome a deficiency on the midterm and improve a student's final grade.

Courtesies: As a courtesy to your instructor and fellow students, please arrive to class on time, turn your cell phones and electronic gadgets off during class, and pay attention in class.