

Department of Mathematics, University of Manitoba
MATH 3322 Algebra 3
2019 Winter Term
Information for Students

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Regular office hours will be announced separately, and will be posted on my web page, with regular updates, and on my office door. I am also available at other times by appointment.

TEXT AND REFERENCE MATERIAL:

An Introduction to Abstract Algebra, Dennis Burley Ames, Course Pack, U of M Bookstore.

Not everything that we cover is in the text; and a few of the things from the text that we do cover will be given a different treatment than in the text.

A standard reference for many parts of this course is: **Abstract Algebra**, Third edition, John A. Beachy and William D. Blair, Waveland Press, 2006.

A somewhat more advanced and detailed book is: **Abstract Algebra**, Second edition, David S. Dummit and Richard M. Foote, Prentice-Hall, 1999.

There will be a copies of all three of these books on reserve in the Science Library.

Additional references: Suitable books are found in the library under the call letters QA 162. Some other books that you may find particularly useful are those by Gallian, Herstein (*Abstract Algebra*), Hungerford, Fraleigh, Lang (*Undergraduate Algebra*), and Rotman, as well as many others. Other recommended books that cover this material at a more advanced level are two by P. M. Cohn: *Classic Algebra* and *Basic Algebra: Groups, Rings and Fields* (both under QA 154).

EVALUATION:

Quizzes At the end of the last class of each week, starting January 11, there will be a 5 minute, single question, quiz asking for a definition or statement of a theorem from the preceding two or three lectures. These 12 quizzes will each be scored out of 3; and the sum of all your scores will be converted to a score out of 10% according to the formula “ $\min\{\text{sum}, 30\} / 3$ ”. There are no deferred or make-up quizzes.

Assignments The primary mode of evaluation will be written assignments. There will be **9** assignments of equal weight during the term, worth 90% of the final grade.

An overall average of 60% will guarantee a C; an average of 80% will guarantee an A. (Intermediate grades are broken down in equal steps.) An A+ represents consistent high quality performance during the term, as demonstrated not only by accuracy but by insight into the course material. A single poor assignment will not, however, end your chances of attaining an A+.

USE OF L^AT_EX: Students are welcome to submit solutions using L^AT_EX if they so desire; this is entirely optional, and I will not be able to spend any significant amount of time helping you with L^AT_EX type-setting questions. You will need to e-mail me and request the style files that support the assignment sources.

ASSIGNMENT DUE DATES: Assignments (on material already covered) will usually be distributed a week to ten days before the given due date:

January 21, January 30, February 06, February 15, March 01, March 11, March 20, March 29, April 08.

WITHDRAWAL: The Voluntary Withdrawal deadline for winter term courses is Wednesday, March 20, 2018.

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WEB SITE: <https://server.math.umanitoba.ca/~tkucera/courses/MATH3322/>

COURSE OUTLINE:

References are to sections in Ames. All time allocations are approximate.

Chapter 0. Unifying principles in Algebra. (3 lectures)

1. Universal Algebra (basic concepts) [Supplementary notes]
2. Category Theory [Supplementary notes and §10-5]

Chapter 1. Group Theory. [12 lectures]

0. Review
 1. Products [§4.5 and supplementary notes]
 2. Free groups and other free algebras [§4-6, §4-7, and supplementary notes]
 3. Fundamental theorem of finitely generated abelian groups. [§4-8]
 4. Subnormal and composition series. Solvable groups. [§4-9]
 5. Ascending central series, nilpotent groups. [§4-10]

Chapter 2. Field Theory and Galois Theory (12 lectures).

0. Review.
 1. Algebraic closure [Supplementary notes].
 2. Splitting fields and normal extensions [§9-5]
 3. Roots of unity [§9-6]
 4. Fundamental Theorem of Galois Theory [§9-7]
 5. Extensions by radicals and the general equation of degree n . [§9-8, §9-9]

Chapter 3. Brief introduction to general Ring Theory (8 lectures).

0. Review [parts of §5.1–§5.5]
 1. Basics of module theory [parts of §7-1, §7-2, §7-5, §7-6]
 2. The radical [§11-1]
 3. Primitive rings [§11-2]
 4. The d.c.c. and simple rings [§11-3]

STATEMENT ON ASSIGNMENTS: The assignments are meant to provide some challenges, and I regard consultation with each of you about the assignment questions to be a normal part of the teaching process. You do not lose credit for asking me for help with assignment questions; rather, you improve your chances of a good mark. You must take advantage of my office hours to do well on the assignments.

ACADEMIC INTEGRITY DECLARATION: You will be required to read the Statements on Assignments and Academic Integrity, and sign an **Academic Integrity Declaration** before the first Quiz.

GENERAL INFORMATION: Important general information for students is contained in **Schedule A**, available through the course web site.

USE OF TECHNOLOGY AND COPYRIGHT NOTICE:

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. In particular, cell-phones and other devices are not to be used for communication or entertainment during class time.

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