

Abstract Algebra

Loyola University Chicago – Math 313.001 – Fall 2011

Course Syllabus & Ground Rules

Course Details

Class Meetings: Mundelein Center, Room 303; Tu/Th 11:30–12:45 p.m.

Office Hours: Loyola Hall, Room 302; Mo/Tu/We 2:00–2:50 p.m.

FINAL EXAM:

- what: cumulative, closed-book, closed-notes, no calculators allowed.
- when: Tuesday, December 13, 9:00 a.m.–11:00 a.m.

Course Texts:

(Principle) C. Pinter, *A book of abstract algebra*, 2nd ed. (2010), ISBN# 978-0-486-47417-5, Dover Publ.

(Supplementary) J. Scherk, *Algebra: a computational introduction*, 2nd ed. (2009), CC license (.

Instructor Coordinates

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Contact

Communication by email is preferred. Include **313** in the subject line. Expect a reply within 48 hours.

Course Web Page

This document and other information and materials relevant to the course are posted on the course web page (<http://www.math.luc.edu/~lauve/courses/313-fa2011/>).

Important Dates

If you are unable to make any of the exam dates, please let me know as soon as possible.

Last day to drop, no penalty	September 11	<i>Thanksgiving</i>	11/24
<i>Fall break</i>	10/11	Last day of class	December 8
Exam #1	October 20	Final Exam	December 17
Last day to drop, “W”	November 4		

Requests to reschedule your final exam will be heard only for extenuating circumstances (e.g., **three** exams in one day is **not** deemed burdensome enough) and must be made through your Dean’s office.

Course Summary

SYLLABUS. Most of Chapters 2–16 in Pinter (<http://www.luc.edu/math/coursedescrifall.shtml#Math313>).

PREREQUISITES. Math 201 (elementary number theory) and Math 212 (linear algebra).

Why algebra? From Wikipedia: Algebra is the branch of mathematics concerning the study of structure, relation, and quantity. As “structure” is everywhere, it is safe to say that every mathematician must be familiar with the basics of algebra (in this course, we focus on *groups*). Branches as disparate as functional analysis, algebraic geometry, algebraic topology, coding theory, combinatorics, and mathematical physics all use algebraic methods to formulate and prove results.

Algebra's applications? In this course, a few applications of algebra are revealed: the basics of **error-correcting codes**, **automata theory** and **Pólya counting**. Crowning jewels from the early history of the theory such as **factoring quintic polynomials** and **squaring the circle** will have to wait for 314 (where *rings* and *fields* are introduced). More modern applications of algebra, such as using Lie groups in differential equations, cognitive science and quantum mechanics will, unfortunately, have to wait for a special topics course. (*Ask for it!!*)

Technology

We may use *Mathematica* from time to time, as it contains some rudimentary methods from group theory. *Mathematica* is free for every Loyola University student (<https://myits.luc.edu/mathematica>). If you need help installing it, let me know. (You'll need to log in using your Loyola Network ID.)

Course Components

HOMEWORK. Students will work and submit homework exercises drawn from the Pinter's text. These will be due at the start of class, two class periods after a chapter is finished. The **lowest two** scores will be dropped when computing final grades. Assignments will be graded on the following criteria:

Accuracy (90%). I hope this is self evident.

Neatness & Clarity (10%). Preserve your grader's sanity and practice communicating mathematics.

(*N*): Write as legibly as you can; if you choose to write in multi-column format, then crease the page down the middle beforehand to give yourself another margin; write on only one side of each page; staple your work together; submit tidy paper (i.e., no crinkles or spiral-bound jaggedness).

(*C*): Use complete sentences (often) and proper mathematical grammar (always). It takes time to learn how much to say (students say too much as often as not enough). Use the textbook's solutions as a guide (e.g., **2.A.3** and **2.B.7** on pages 22, 23, and 355).

Students may work in groups on their homework (preferably groups of three), but each must submit his or her own copy. Rules for group work: (i) names of other group members must be listed below your name; (ii) I will, from time to time and with little forewarning, ask students to defend their answers during my office hours.

READING QUIZZES. Quick "check your understanding" quizzes will be given at the start of class on days that we begin a new chapter. Students should come to these classes having read the text for basic definitions, theorems and examples. Students will need to purchase an **Exam Blue Book** for these quizzes. The **lowest two** scores will be dropped when computing final grades.

EXAMS. There will be one midterm exam. The final exam will be cumulative.

Course Grade

Course letter grades will be adjusted from the 90/80/70/60 scale as necessary, weighted as below.

$$\text{HW (40\%)} + \text{RQ (10\%)} + \text{EX (30\%)} + \text{FINAL (20\%)} = 100\%$$

Master's Students

Students enrolled in the BS/MS or MS programs should maintain **higher standards** than those in the BS program. (In practice, this means submitting more homework and completing more exam problems.)

Disability Services

The Americans with Disabilities Act (ADA) is a federal statute that provides comprehensive civil rights protection for persons with disabilities. It requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact the SSWD office: in the Sullivan Center, suite 117, phone 773.508.3700, fax 773.508.3810, or online at <http://www.luc.edu/sswd/>.

Getting Help

It may take awhile to adjust to the different style and pace of the course. For instance, I will expect the student to read and comprehend much beyond what is covered in lecture. My first piece of advice is to use your book well: learn the definitions and read the examples' solutions; do not be satisfied with the Pinter assignments, but instead work related problems from J. Scherk's text.

Please, **SEEK HELP** if you are falling behind. Form study groups, come to my office hours, find online resources (e.g., <http://www.extension.harvard.edu/openlearning/math222/>), meet me outside of my office hours, give me feedback, find a tutor, etc.

Escape Routes

At any time, even after the last date for W-dropping the course, students who are experiencing medical or personal difficulties should not hesitate to consult their advisors or the Student Development Office or their dean. Don't allow yourself to be overwhelmed by such problems; Loyola has resource persons who may be able to help you.

Academic Integrity

The Academic Standards and Regulations web page

<http://www.luc.edu/academics/catalog/undergrad/reg.shtml>

outlines the definition and ramifications of cheating at Loyola University (the "Academic Integrity" link) as well as the recourses available to you should you be accused of cheating (the "Academic Grievance Procedure" link). By attending this course, you agree to uphold the high standards of Loyola. If you are found cheating on an exam, **you will receive a zero(0) for the exam** and the incident will be reported to your academic dean and recorded in your permanent file.

Course Etiquette

Sleeping in class happens and is always forgiven. Reading newspapers or surfing the web is impolite and is a distraction to your instructor; please find a better use for your time. Please set your cell phones to "silent" upon entering class; these are a distraction to everyone. Likewise, talking with your neighbor while I am lecturing is **unacceptable**.

Finally, and most importantly, respect for others is *stressed* above all else; please allow me the **first chance** to answer your fellow students' questions. I expect everybody to participate in class discussions, but that begins by fostering an environment where we do not hesitate to ask our questions.

Odds and Ends

MAKE-UP QUIZZES/EXAMS. If a real emergency or University-sponsored event arises which prevents you from appearing at a scheduled examination time, you must notify me prior to the next regularly scheduled class (and before the examination if possible). Make-up examinations will be administered only at my discretion. If a student fails to appear for a make-up at the mutually arranged time, no further opportunities will be extended. **Failure** to contact me as stated above or sufficiently document the extenuating circumstances of your absence will result in a grade of zero on the examination.

LOYOLA EMAIL. On the occasion that I need to contact students outside of class, this is the only sensible way to proceed. If you would rather not use your @luc.edu email account, ... tough! If you are unable to receive my email messages, please let me know.

Applied Algebra

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Sample Reading Quiz: Chapter 2

1. (3 pts) Give one reason (there are at least two) why the mapping

$$(a, b) \mapsto \frac{a}{1-b}$$

cannot define an *associative operation* on positive real numbers $\mathbb{R}_{>0}$.