Advanced Topics in Abstract Algebra
Loyola University Chicago – Math 314.001 – Spring 2012
Course Syllabus & Ground Rules

Course Details
Class Meetings: Mundelein Center, Room 504; MoWeFr 10:25–11:15 a.m.
Discussion Section: Loyola Hall Seminar Room (1st floor); to be announced on course webpage
Office Hours: Loyola Hall, Room 302; to be announced on course webpage

FINAL EXAM:
• when: Monday, April 30, 9:00 a.m.–11:00 a.m.

Course Texts:
(Principal) J. Scherk, *Algebra: a computational introduction*, 2nd ed. (2009), CC license (Creative Commons Attribution-ShareAlike 4.0 International License).

Instructor Coordinates
Aaron Lauve
Loyola Hall, Room 302  lauve@math.luc.edu
773.508.3727  www.math.luc.edu/~lauve

Contact
Communication by email is preferred. Include 314 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 (www.math.luc.edu/~lauve/314.html).

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

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<th>Event</th>
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<tr>
<td>Last day to drop with no penalty</td>
<td>January 23</td>
<td>Easter Break</td>
<td>4/5–4/9</td>
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<tr>
<td>Exam #1</td>
<td>February 22</td>
<td>Exam #2</td>
<td>April 13</td>
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<tr>
<td>Spring Break</td>
<td>3/5–3/9</td>
<td>Last day of class</td>
<td>April 27</td>
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<td>Last day to drop with a “W”</td>
<td>March 26</td>
<td>Final Exam</td>
<td>April 30</td>
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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 10 and 14–21 in Scherk’s book.

PREREQUISITE. Math 313 (abstract 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 *rings* and *fields*). 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? This course will cover the crowning jewels from the early history of the theory such as factoring quintic polynomials and squaring the circle.

Modern applications of algebra include error-correcting codes, Pólya counting, and using Lie groups in differential equations, cognitive science and quantum mechanics. If you want to see more, it will have to wait for a special topics course. (Ask for it!!)

Technology
We will use Mathematica from time to time, as it contains some rudimentary methods from group theory. Mathematica is free for every Loyola University student (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 Scherk’s text. These will be due at the start of class, three 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: 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 examples and proofs as a guide.

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 Green Book for these quizzes. The lowest two scores will be dropped when computing final grades.

Exams. There will be two midterm exams. 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.

\[ \text{Hw} \ (30\%) + \text{RQ} \ (10\%) + \text{Ex} \ (2 \times 20\%) + \text{Final} \ (20\%) = 100\% \]

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 Scherk assignments, but instead work related problems from Pinter’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.
Before class  Make your computer do the calculations in Section 10.5, up to the end of page 165.

In class  Sample quiz questions:

- True or False: A subgroup $H \subseteq G$ is normal if $aH = Ha$ for all $a \in G$.

- The subgroup $A_4$ is normal in $S_4$. Explain how to compute $(342) \cdot (432)$ in $S_4/A_4$. 