Course Webpage: [http://www.math.utah.edu/~defernex/5310-F17.html](http://www.math.utah.edu/~defernex/5310-F17.html)

Meeting: MWF 12:55–1:45 PM – LCB 222

Instructor: Tommaso de Fernex, office JWB 322, email defernex@math.utah.edu

Office Hours: MF 1:50–2:50 PM – JWB 332


Course Description: The class focuses on groups and linear algebra, with matrix operations leading to many concrete examples of groups (rings, modules, and fields will be the topic of Math 5320). The course is designed to introduce students to the abstract aspect of the theory while learning about some of its applications. Proofs of the fundamental properties will be covered in a rigorous manner, with the goal to further improve the student’s ability to assimilate abstract concepts and understand their interrelationships.

Topics: We will cover material from Chapters 2-7 of the book, including the following list of topics.

- Groups, subgroups, homomorphisms
- Equivalence relations, cosets and conjugacy classes, theorem of Lagrange
- Modular arithmetic, fields and finite fields
- Normal subgroups, quotient groups, and the first isomorphism theorem
- Vector spaces over a field
- The meaning of row column operations, dimension of vector spaces
- Quotient spaces, their dimension
- Linear transformations, a brief discussion of Jordan normal form
- Orthogonal transformations, theorem of Euler for dimension 3
- Group actions, application to classification of finite subgroups in SO(3)
- The class equation and simplicity of icosahedral group
- The first Sylow theorem

Prerequisites: “C” or better in Math 3210 and (Math 3220 or Math 4400 or Math 4510). Students are expected to have some familiarity with the basics on matrices and set theory. To this end, it is advised to review Chapter 1 of the textbook and any introductory chapter on set theory (e.g., Chapter 1 of ”Foundations of Analysis” by J. L. Taylor).

Coursework and Grading: Grading is based on the following evaluation method:

- Weekly homework assignments, counting 30% toward the final grade.
- Two in-class midterms, each counting 20% toward the final grade.
- Final exam, counting 30% toward the final grade.
The lowest two homework grades are dropped. Homework assignments will be weekly posted on the course webpage.

**Midterms and Final:** All exams take place in the usual classroom, with the two midterms during usual class time.

- First midterm: Friday, September 22
- Second midterm: Friday, November 3
- Final: Tuesday, December 12, 1:00–3:00 PM

During the exam you are not allowed access to the textbook, note cards, calculator, phone, or any other aid material. You are allow to use a blank scratch paper. If you are caught cheating, you may receive partial or no credit for part or all of your exam, depending on the severity of the cheating, and risk to be reported to the Dean of Students.

**ADA:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. Students are encouraged to approach the instructor and the Center for Disability Services to make suitable arrangements if needing special accommodations.