Mathematics 327 — Group Theory — Spring 2014

MWF 10:00 – 10:50 am   King 239

Instructor: Susan Jane Colley
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Office Hours:

Monday	3:30 – 5:00 pm
Tuesday	9:30 – 10:30 am, 3:00 – 4:30 pm
Wednesday	3:30 – 5:00 pm
Thursday	4:30 – 5:30 pm
Friday	11:00 am – noon, 1:30 – 2:30 pm

Also by appointment

Text: M. A. Armstrong, *Groups and Symmetry*, Springer. This text is required and available at the Oberlin Bookstore. Copies of a recommended supplement, K. Houston, *How to Think Like a Mathematician*, Cambridge are also available at the Bookstore. Several additional supplementary books and articles are appended to this syllabus.

Goals: We will study a number of topics from group theory. Some of this investigation will be from an entirely abstract point of view, but we will also devote considerable attention to the way in which group-theoretic ideas interact with other parts of mathematics, particularly geometry and symmetry.

Homework: There will be weekly, hand-in problem sets, usually due on Wednesday. You may work together on the homework, but you must submit your own write-up of the problems. Late assignments will not be accepted (emergencies excepted, of course). Solutions to the hand-in problem sets will be available online.

Examinations: There will be two open-book, take-home exams, tentatively due on **March 12** and **April 23**. Please let me know as soon as possible if there is a problem with either of these dates. There will also be an in-class final exam on **Wednesday, May 14, 7:00–9:00 pm**.

Special Project: You are expected to attend class regularly and to participate actively by asking questions, offering problem solutions, etc. In addition, you will work with two other students on an independent project related to group theory.

The project may involve material from the text or from other sources. Each group will submit a written report (~ 5 pages) concerning the project, create a poster, and make a brief (5–10 minute) presentation during a **Special Group Theory Session to be scheduled May 3–4**. Additional details concerning the project will be forthcoming.

Online: Copies of assignments, handouts, etc. will be posted on the course Blackboard site. Go to **`blackboard.oberlin.edu`** (and your "Academic Hub") to access these materials.

Note: If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible.

Grading:

Take-home midterms (each)	25%
Final exam	25%
Homework and Special Project	25%

(percentages of final grade)

Outline of the Course

Introduction and basic notions (Chapters 1 – 8)	4 weeks
Products, quotients, homomorphisms (Chapters 9 – 16)	4 weeks
Group actions and enumeration (Chapters 17 – 19)	2 weeks
Sylow theorems, structure of abelian groups (Chapters 20 – 22)	2 weeks
Additional topics	as time permits

Selected Bibliography

Here are some suggestions for supplementary reading. You may find some of these references helpful for putting together your oral presentation, but in no way should you feel constrained by them.

BOOKS

F. J. Budden, *The Fascination of Groups,* Cambridge University Press, 1972.*

N. C. Carter, *Visual Group Theory*, Mathematical Association of America, 2009*

D. Joyner, *Adventures in Group Theory,* Johns Hopkins University Press, 2002.*

R. C. Lyndon, *Groups and Geometry,* Cambridge University Press, 1985.

G. Pólya and R. C. Read, *Combinatorial Enumeration of Groups, Graphs, and Chemical Compounds,* Springer, 1987.

H. Weyl, *Symmetry,* Princeton University Press, 1952.

I. M. Yaglom, *Felix Klein and Sophus Lie: Evolution of the Idea of Symmetry in the Ninteenth Century,* Birkhäuser, 1988.

ARTICLES

J. L. Alperin, "Groups and symmetry," *Mathematics Today,* 65–82, L. A. Steen, ed., Springer 1978.

M. Gardner, "The capture of the monster," *Scientific American* **242** (1980), no. 6, 20–32.

D. Gorenstein, "The enormous theorem," *Scientific American* **253** (1985), no. 6, 104–115.

D. Hecker and R. Banerji, "The slice group in Rubik's cube," *Math. Magazine* **58** (1985), no. 4, 211–221.

I. Kleiner, "The evolution of group theory: a brief survey," *Math. Magazine* **59** (1986), *no*. 4, 195–215.

J. L. Leavitt, G. J. Sherman, M. E. Walker, "Rewriteability in finite groups," *Amer. Math. Monthly* **99** (1992), no. 5, 446–452.

E. C. Turner and K. F. Gold, "Rubik's groups," *Amer. Math. Monthly* **92** (1985), no. 9, 617–629.

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* On reserve in Mudd.

Honor Code Policies

Homework

You are permitted, even encouraged, to collaborate on homework. For homework that is not graded, feel free to consult anyone at all: your classmates, me, other students, friends, relatives, Barack Obama, Stephen Colbert (these last two not really). For homework that is to be handed in and graded, I expect you to be somewhat more careful. Specifically, you should continue to ask questions of me regarding homework problems and you may collaborate with one or two of your classmates (per assignment). Please do not undertake significant collaboration with more than two students without permission. If you do collaborate, you are expected to write your own solution to problems (i.e., not to copy) and to indicate the name(s) of any student(s) with whom you worked.

You may consult any written sources for hand-in homework, provided that you give appropriate citations. Please write your homework solutions with care.

Examinations

Unless specifically indicated otherwise, in-class tests are assumed to be closed-book. Collaboration of any sort (other than to ask me questions) will **not** be permitted. Take-home exams will have specific provisions for using books and notes, but, again, you are **not** to discuss the content of the exam with anyone other than me. Any time limits will be indicated with each test.

Independent Project

Obviously, your primary contacts for your project should be your partners and me. It is also acceptable for you to consult with others, provided you give appropriate citation in your presentation and your written report.

Honor Pledge

On every assignment that you submit for credit, you are expected to sign the Oberlin College Honor Pledge:

"I have adhered to the Honor Code on this assignment."

If you need clarification of the policies above, please do not hesitate to ask. Should you require some variation in these rules, you must discuss the matter with me well in advance of any assignment.

For more information about the Oberlin Honor Code, please see

< http://www.oberlin.edu/studentpolicies/honorcode/ >.