Math 103A Fall 2006: Applied Modern Algebra
MWF 10-10:50am, Center Hall 205
Professor Daniel Rogalski

1. Contact Information

Prof. Rogalski's Office: 5131 AP&M
E-mail: drogalsk@math.ucsd.edu
Class web site: *www.math.ucsd.edu/~drogalsk/103a.html*. Check frequently for updated homework and lecture information.
Office hours: TBA, check website

Section Leader: Amanda Beeson (Office location TBA)
E-mail: ambeeson@math.ucsd.edu
Meeting Times: Tue 10-10:50am in Center Hall 207
Office hours: TBA, check website

2. Class Description

This is a first class in abstract algebra. The main topic will be the theory of groups, covering chapters 0-11 of Gallian's book. The formal prerequisite is previous or concurrent enrollment in Math 109. However, concurrent enrollment is not recommended unless you are highly motivated or have previously learned some of the topics in Math 109 on you own or in a similar course.

Your grade in this class will be based on your writeups to weekly homework assignments (25%), 2 in-class midterms on Wednesday 10/18 and Wednesday 11/8 (25%), and a final exam on Friday 12/4 from 8-11am (50%). No makeup exams will be given. Some of the homework problems will be quite challenging, some less so. You should expect to spend a lot of time thinking about some of these exercises before the solution is clear to you, and the write-ups you submit should be clear, neat, and well-organized (not rough drafts). Start the homework early, so you can ask questions about it in section or office hours. A thorough understanding of the homework exercises is the key to success on the exams as well. Homework will be due on Fridays. Late homework will not be accepted, but the lowest homework score will be dropped. To see me or the section leader at a time other than the scheduled office hours, please set up an appointment by e-mail.

3. The textbook

The textbook is *Contemporary Abstract Algebra* by Gallian. It is very well written, so reading it will be valuable– seeing the material presented a second time will help cement the concepts for you. While the lectures will stick fairly close to the book in terms of the overall topics included, we will not always follow the order of the book. The tentative syllabus below will give you a general idea of how we will skip around, and I will give you updates in lecture so that you know what sections of the book to read when. Whether you read about a topic before or after it is presented in class is up to you. My edition of the book is the 6th. If you have an earlier edition, the most important thing is to note that the exercises may be different or numbered differently, so check the homework problems against the 6th edition of a friend.

4. Tentative Syllabus

The following is just a suggested outline of what we will cover when. This is subject to change, and updates to the schedule will be announced in class and posted on the website.

9/22 Introduction to course. Chap 0: Arithmetic. Proof by induction.

9/25 Chap 0: Equivalence relations. Binary operations.
9/27 Chap 2: Definitions of groups. First examples.
9/29 Chap 2: More examples of groups. Basic properties of groups.

10/2 Chap 1: Dihedral groups.
10/4 Chap 3: Subgroups. Examples.
10/6 Chap 3: More examples of subgroups/centers and centralizers.

10/9 Chap 4: Cyclic groups I (basic definitions and properties)
10/11 Chap 7: Cosets and Lagrange's Theorem. Corollaries.
10/13 Chap 9: Normal subgroups. Factor groups.

10/16 Chap 9: More examples of factor groups. Chap 10: Homomorphisms.
10/18 **EXAM I**
10/20 Chap 10: Properties of homomorphisms. First isomorphism theorem.

10/23 Chap 4: Cyclic groups II (more advanced properties)
10/25 Chap 5: Permutation groups. Cycle notation and order of a permutation.
10/27 Chap 5: Decomposition into 2-cycles/alternating group.

10/30 Chap 5: Some applications of permutation groups.
11/1 Chap 6: Isomorphisms. Examples.
11/3 Chap 8: Direct Products.

11/6 Chap 8: More on direct products. Decomposing Z_n and $U(n)$.
11/8 **EXAM II**
11/10 **Veteran's Day (NO CLASS)**

11/13 Chap 8: Application to RSA cryptography.
11/15 Classifying groups up to isomorphism. Chap 7: Groups of order p and $2p$.
11/17 Chap 9: G/Z theorem. Existence of elements of order p.

11/20 Chap 11: Fundamental theorem of abelian groups.
11/22 Chap 11: Examples of the fundamental theorem.
11/24 **NO CLASS**

11/27 Chap 7: Orbit-stabilizer theorem. Applications.
11/29 Special topic or catchup day.
12/1 Special topic or catchup day.

12/4 Final exam, 3-6pm.