Math 313   Modern Algebra   **Fall 2007**
PPHAC 113
M W F   8:50 a.m. – 10:00 a.m.

Instructor: Alicia Sevilla
Office: PPHAC 217
Telephone: 610-861-1573 (office), 610-867-1787 (home);
E-mail: means01@moravian.edu;
Office hours: M W F, 1:45 p.m. – 2:45 p.m., Tu 3 p.m. – 4 p.m. and by appointment

Course Prerequisites: This course has for prerequisite Math 216 and assumes
familiarity with basic methods of mathematical proof.

Textbook : *Abstract Algebra: A First Undergraduate Course*, fifth edition, by Abraham
Hillman and Gerald Alexanderson, Waveland Press, Inc.,1994

Course Goals: After successful completion of this course, you are expected to:
- understand and be able to work with the basic concepts and definitions in
  group and ring theory
- develop and improve your skills at writing and reading mathematical
  proofs
- be prepared for future study in the area of abstract algebra, or other higher
  level mathematics
- have some knowledge about applications of abstract algebra

Course Content: This course is an introduction to the modern, abstract approach to the
problems of algebra. We will cover most of chapter 1 of the textbook as a review; then
we will cover most of chapter 2, and selected sections of chapters 3, 4, 5 and 8.

Topics to be covered include:

Review of basic properties of the integers: mathematical induction, multiples and divisors,
primes, the division algorithm, common divisors, Euclid's algorithm, common multiples.

Groups: permutations, abstract groups, subgroups, cyclic groups, groups of permutations,
groups of symmetries, alternating groups, cosets of a subgroup, quotient groups.

Sets and Mappings: mappings, group isomorphisms, group homomorphisms, Cayley's theorem.

Rings and Fields: rings, ring homomorphisms and ideals, congruence in the set of integers, the
Euler and Fermat theorems, integral domains, fields, matrices and quaternions.

Polynomials: polynomial extensions of rings, polynomials over a commutative ring, divisibility
in commutative rings, polynomial functions.

Some applications to coding: binary codes, matrix codes, a hamming code, modular codes,
trapdoor functions

Homework Assignments: Daily reading and writing assignments will be given. You are expected to complete all assignments when due and to come to class prepared to answer and ask questions. Some assignments (you will know in advance which ones) will be collected and graded. For ungraded written homework assignments, you are encouraged to work with other students, but all work to be handed in for grading must be done individually. The Academic Honesty Policy guidelines for Mathematics courses, which are copied at the end of this document, are to be followed.

Graded assignments **must be turned in by 4 p.m. on the date due to be graded without penalty**. No assignment will be accepted after graded papers have been returned to the students.

Projects: Each student will write a paper and make a 10-minute class presentation on a modern algebra topic chosen by the student and approved by the instructor. You must notify Dr. Sevilla of the choice of topic by **November 19**. The paper is due **December 5**. In class presentations will take place during the last week of classes.

Attendance to Mathematics Colloquia and/or other mathematical events: The Mathematics and Computer Science sponsors a Mathematics Colloquium approximately once a month. These are mathematical lectures on different subjects given by professors from Moravian or from other colleges. The schedule for this semester is not finalized yet, Details will be announced in class, as soon as they become available. You are required to attend at least **two** of the colloquia and write a one-page summary/reaction for each one attended. Many of these talks might use or mention a topic of modern algebra. In your short paper, you should explicitly mention any connection you found or may make between the material in the talk and the topics in this course. You are of course encouraged to attend every Mathematics Colloquium.

As an alternative to attendance to one colloquium talk, you may attend and write about two "Epsilon Talks", sponsored by the student organizations MC Mathematical Society and Pi Mu Epsilon-Omicron Chapter. (Note that attendance to *one* colloquium talk can be substituted by attendance to *two* epsilon talks.)

Examinations: There will be three in class exams and one cumulative final examination. The days of the in-class exams are as follows.
  Monday, September 24   Wednesday, October 24   Wednesday, November 28

Grading:

Graded homework	20%
Class participation (including board presentations)	10%
In-class exams	42 % (14% each)
Attendance to Math Colloquia and follow-up papers)	5%
Project (paper and presentation)	8%
Final exam	15%

Attendance: Class attendance is required. Students are responsible for all work covered in class and all assignments, even if absent from class. If a student must miss more than one class due to illness or emergency, the instructor should be notified. In-class exams must be taken at the announced time; make-up exams will be given only in case of extreme emergency or serious illness.

Help: Students are encouraged to see Dr. Sevilla during office hours or to arrange an appointment for extra help when needed.

Special Accommodations: Students with disabilities who believe that they may need accommodations in this class should contact the Learning Services Office as soon as possible to enhance the likelihood that such accommodations are available.

Note: *This syllabus is a guideline for the course. It may be necessary to make changes during the semester. I will announce any changes in class.*

ACADEMIC HONESTY POLICY GUIDELINES

MATHEMATICS COURSES

The Mathematics and Computer Science Department supports and is governed by the *Academic Honesty Policy of Moravian College* as stated in the Moravian College Student Handbook. The following statements will help clarify the policies of members of the Mathematics faculty.

In all homework assignments that are to be graded, you may use your class notes and any books or library sources. When you use the ideas or thoughts of others, however, you <u>must</u> acknowledge the source. For graded homework assignments, you may not use a solution manual or the help, orally or in written form, of an individual other than your instructor. If you receive help from anyone other than your instructor or if you fail to reference your sources you will be violating the *Academic Honesty Policy of Moravian College*. For homework that is not to be graded, if you choose, you may work with your fellow students. You are responsible for understanding and being able to explain the solutions of all assigned problems, both graded and ungraded.

All in-class or take-home tests and quizzes are to be completed by you alone without the aid of books, study sheets, or formula sheets unless specifically allowed by you instructor for a particular test.