MATH 816 MODERN ALGEBRA I FALL 2004

Instructor: Professor Solomon Friedberg
Carney Hall, Room 325
617 552-3002
friedber@bc.edu

Office Hours: Monday and Friday 10-11, Wedneday 12-1 (tentative). In addition, you are always welcome to make an appointment to see me outside of office hours.

Text: Topics in Algebra, Second Edition, by I. N. Herstein, John Wiley & Sons.

Prerequisite: A one semester undergraduate course in Abstract Algebra (covering group theory and perhaps a little ring theory), or the consent of the instructor. It is possible to take this course without prior knowledge of Abstract Algebra provided you have previous exposure to proofs or a talent for abstract thinking. However, doing so requires an extensive time commitment to the course.

Website: Homework assignments (and this syllabus) are posted on the class website: http://www2.bc.edu/~friedber/mt816

Grade: Regular attendance at lectures is required. It is difficult to imagine someone learning the material without such attendance.

Regular required homework will count for 20% of your grade. ***In this course more than almost any other, allocating the time to work on the homework is crucial.*** The homework will be assigned every one to two weeks. You are expected to work on the problems from the day that they are assigned. The problems will range in difficulty from the easy to the challenging, and it would be difficult to do any but the easiest problems if you left the homework until just before it is due. You may find yourself unable to do a problem; you should keep working on it, seeking new ideas for its solution. You are also welcome to come to my office hours, where I will provide hints to help you. Please note: you are allowed to discuss the problems with other students in the class. However, ***you must write up your answers by yourself.*** Thus two

students should not hand in identical solutions. *You are not allowed to use other books or materials handed out in other courses in order to obtain a solution.*

There will be two midterms during the semester, each of which will count for 20% of the grade, plus a cumulative final, which will count for 40% of your grade. The **midterms** are (tentatively) scheduled for **Friday October 8** and **Monday November 15**. The **final examination** will be held on **Friday December 17** at **12:30 p.m.** This date and time are fixed by the Registrar and may not be changed. Improvement on the final, if any, will also be taken into account in determining your grade. Please note: there will be no make-up examinations.

All students are expected to adhere to the Boston College standards regarding academic integrity. These may be found on the website www.bc.edu/offices/stserv/academic/resources/policy/#integrity

Course Description: This course is concerned with the abstract algebra. This is one of the most fundamental areas of modern mathematics. The idea is to study mathematical structures with simple rules--so simple that they may be found in many different areas--and yet to see that these simple rules impose a rich structure upon the objects. Much of the course will be concerned with Group Theory. Groups are behind such diversions as the Rubrik's cube, and they are also behind the study of symmetries of molecules and of other physical structures. They play a central role in modern mathematics.

This is a graduate course, and the depth of the material presented and the pace of the presentation will reflect this. *You should plan on spending at least one hour, and perhaps many more, after* ***each*** *lecture, learning the material presented completely.* This includes learning the proofs as well as the Theorems. The material is very structured, with each lecture building on the previous ones, and it is not possible to do well in the course if you do not master each concept right away but rather leave them until the exams. Please feel free to consult with me in office hours if you are confused or unsure about any concept or result! I recommend strongly that you plan for a significant time commitment to the course.

A word about learning proofs: I will expect you to learn many of the proofs presented in class. That is, I will expect you to be able to present them yourself if requested on an examination. To avoid an elaborate memory exercise, try to look beyond the details of each proof presented to *extract the idea* (or ideas) behind it. It is these *ideas* which you should learn. It happens frequently that ideas which arise in one proof play a role in other proofs; by learning them you will be better prepared to understand the material and to do problems.

Additional references: There are many other books on abstract algebra in the library. In my opinion, Herstein's is the best, but four others are the easier algebra book of Herstein (used recently at BC for the undergraduate course, Math 310), *Abstract Algebra*, and the algebra books by Fraleigh, Rotman, and Saracino. More sophisticated books, typically used for a graduate course which requires a course such as this one as a prerequisite, are *Algebra* by Hungerford (in the Springer Graduate Texts in Mathematics series), and *Basic Algebra I, II* by Jacobson. Both these books start from first principles. Hungerford's proofs are wordy but complete (it is not always easy to separate the essential idea from all the details), while Jacobson's are concise and focused. (Hungerford also has many easy problems, while Jacobson's are sometimes very challenging.) There are also graduate texts by Lang and by Rotman (Rotman's is very complete but has an enormous number of typos, while Lang's is very sophisticated and covers the topics of concern to us relatively briefly).