Math 222

Introduction to Abstract Mathematics – Fall 2007

67-222-001 9:10–10:10 MWF Swart 303

"Mathematics is the tool specially suited for dealing with abstract concepts of any kind and there is no limit to its power in this field."

- Dirac, Paul Adrien Maurice (1902-1984)

"The science of pure mathematics ... may claim to be the most original creation of the human spirit. "

-Whitehead, Alfred North (1861-1947)

In many of your previous mathematics courses (including basic algebra, calculus, and linear algebra), understanding has often been closely tied to computations and algorithms (e.g. solving an equation, taking a derivative, row-reducing a matrix, etc.). In Math 222, we will focus instead on deductive argument. Logical reasoning and proof are the foundation of mathematics, and distinguish this subject from the other sciences. To truly understand mathematics then, one needs to have a firm grasp of these fundamental concepts, and that will be our goal in this class. We will emphasize precise mathematical language, abstraction and proof. We'll problem-solve, generalize, classify and conjecture. In short, in this course we will get an understanding of what it means to really **do** mathematics!

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Office Hours: MW ≈8:10–8:50 (for quick questions), T 11:00–12:00, F 1:50-2:30. These are my weekly scheduled office hours, and I will have additional office hours as my schedule permits. In addition, I am available at other times as well. Just ask!

Text: *An Introduction to Abstract Mathematics*, by R. Bond and W. Keane

Course Topics: Math 222 is really all about the language of proof. We will start the course with an introduction to problem solving and mathematical reasoning with the goal of developing some context for the more formal ideas which will follow. In particular, we'll gain a sense of the necessity of a proof and what constitutes a proof. We'll spend a short time considering formal logic (including truth tables and quantifiers). We will spend much of the semester laying a careful foundation for some mathematical objects with which you are probably already familiar. These include the notions of function, set, relation, and number systems. With our focus on making rigorous arguments, we will discuss proof techniques throughout the class, including direct proofs, proofs by contradiction, and induction. In our investigation of these course topics, we will cover most of chapters 1–5 of Bond and Keane's text, and we'll supplement their text with some outside materials as well.

You can learn mathematics *only* by doing it. Therefore, you will be active participants in the learning process in Math 222. Although I will lecture on a good bit of the material in the course, much of the class will also be student-generated, involving cooperative group-work and class discussions.

Assessment

Exams: I have scheduled 3 evening exams for the course, to be given in **Nursing/Education 151** from 6:00–9:00 pm on the following dates: **Tuesday, October 2**, **Thursday, November 8**, and **Thursday, December 13**.

Each exam will be worth 20% of your total course grade. Arrangements for conflicts due to **University sponsored activities** must be made at least one week in advance.

Attendance: Attendance in this course is required, and will compose 5% of your grade. You will be allowed 2 absences without penalty. For each subsequent absence, you will lose one-half of a percentage point from your attendance grade. Note: arriving late to class or leaving early counts as one-half of a miss.

Homework: Extensive homework will be assigned, and I will collect some, but not all, of it. Though some will be computational in nature, the vast majority will not. Expect to do lots of thinking (and proving!) on your problem sets.

Quizzes: We will have **many** quizzes over the course of the semester. Some will be short, based on definitions, terminology and examples, and some will be more extensive.

Other Coursework: Over the course of the semester, we'll have a few other interesting activities and assignments. On many days, we'll work in groups solving problems.

In summary, your grade will be determined by the following:

3 exams (20% each)	60%
Quizzes, Homework, Problem Writeups and other class assignments	35%
Attendance	5%
Total	100%

Grading Scale: Grades in the course will be assigned according to the following approximate scale:

A	90	–	100%	of the course points
B	80	–	89%	
C	70	–	79%	
D	60	–	69%	
F	0	–	59%	

Intermediate grades (e.g. AB) will be assigned when a student is sufficiently close to the cutoff for the next highest grade.