

**Mathematics MAT 305 : Fundamental Structures of Mathematics**  
**Fall 2007**  
**MF 12:30 p.m. - 1:45 p.m., Room 115**

**Instructor:** Dr. Brad Emmons

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**Office Hours:** Tuesday, 9:30 - 10:30, Thursday 9:30 - 11:30, or by appointment

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### **Course Materials**

A Transition to Advanced Mathematics, Sixth Edition, Smith, Eggen, St. Andre (required)

### **Introduction**

This course is designed to give you the required background material to be able to explore more advanced areas of mathematics. By now you have taken Algebra, Geometry, Calculus and perhaps a half-dozen other intimidating sounding math classes. In those classes you learned a certain aspect of mathematical problem solving. That is, you learned how to formulate a problem mathematically and solve it using the computational tools taught in those courses.

At this point in our mathematical education our focus shifts from being able to come up with the right answer to a problem to being able to *prove* that our techniques are correct. That is correct. We are going to prove things in this course.

Most advanced courses in mathematics requires us to precisely formulate our problems. And so we need a precise language to do this. It is this language that we will be learning in this course. We will learn the elementary rules of logic, set theory, equivalence relations, and functions and how these rules fit into our framework of mathematics.

### **Exams**

There will be two in-class exams as well as a final cumulative exam. The exams will test your ability to work through some of the computations, your ability to apply the techniques to certain applications, as well as your ability to prove certain theorems using these techniques. The first exam is scheduled for Friday, September 28 and will count for 20 percent of your final grade. The second exam is scheduled for Friday, November 2 and will count for 20 percent of your final grade. The final exam will be held on Thursday, December 13 from 9:00 a.m. to 11:30 a.m. The final will count for 20 percent of your final grade. There will be NO make-ups for missed exams. Please look over your schedule as soon as possible. If you see a potential conflict, inform me immediately.

### **Homework**

The best way to learn Mathematics is to solve problems. Homework will be assigned at the end of each class period and collected the following class period. I will choose 4 or 5 problems to grade in each assignment. To earn full credit for a problem, a complete solution to the problem must be submitted. Just writing down the answer will not earn full credit. In addition to points for each graded problem, 5 points on each assignment will count for completeness and neatness of the graded assignment. Late assignments will not be graded, but they will be eligible for the 5 completion points. If you are not in class the day an assignment is collected, you may turn in your assignment into my office later that day. However, your assignment will be considered late. The homework is designed to help you identify where you might have difficulties. If you encounter any trouble with an assignment or a concept, seek help! The homework will count for 20% of your final grade.

### **Quizzes**

Every other Friday, starting with September 7th, we will have an in-class quiz. There will be a total of 6 quizzes throughout the semester. You should treat the quizzes as mini-exams, covering material from approximately 2 weeks worth of course work. The quizzes will consists of 4 or 5 problems similar to problems from your graded homework, and they are to make sure that you are keeping up with the concepts presented in class, and to identify where you are having problems before you take the exams. The quizzes will count for 20% of your final grade.

### **Attendance**

Attendance in MAT 305 is extremely important. Although there is no official attendance policy, note

that if you are not in class on a particular day, your homework will not be graded for a score. I will also require that you be in class at 12:30 p.m. and no later. If you are late to class, you may stay to enjoy the wonderful learning experience. However, your homework assignment for the day will be considered late.

### **Grading**

Your grade in this course will be based on three main factors: homework, quizzes and exams. The homework will be worth 20% of your final grade, the quizzes 20%, and the exams 60%. In addition to these factors, minor ethereal factors such attendance, class participation, attitude, and improvement over the course of the semester can also affect your grade. To determine your final grade, 90–100% = A, 80–89% = B, 70–79% = C, 60–69% = D, 59 and below = F, with the top two percents receiving a + and the bottom two percents receiving a –.

### **Calculators**

Because this course is not computational based in any manner, the use of calculators is not allowed.

### **Important Dates**

Friday, September 7 – Quiz I  
Friday, September 21 – Quiz II  
Friday, September 28 – Exam I  
Monday, October 8 – Fall Break  
Friday, October 12 – Quiz III  
Friday, October 26 – Quiz IV  
Friday, November 2 – Exam II  
Friday, November 16 – Quiz V  
Friday, December 7 – Quiz VI  
Thursday, December 13, 9:00 - 11:30 – Final Exam

### **Suggestions**

Come to class with your homework assignment completed every day  
Study for at least 2 hours each day in addition to completing your homework assignment  
Read the section we will be covering in class *before* arriving to class  
Do not fall behind!  
Come to office hours to discuss homework and concepts. I am here to help!

## Syllabus

MAT 305 : Fundamental Structures of Mathematics

Fall 2006

Week 1	August 31	Course Policies, Syllabus, Section 1.1
Week 2	September 3	Section 1.2 – Conditionals and Biconditionals
	September 7	Section 1.3 – Quantifiers, <b>Quiz I</b>
Week 3	September 10	Section 1.4 – Basic Proof Methods I
	September 14	Section 1.5 – Basic Proof Methods II
Week 4	September 17	Section 1.6 – Proofs Involving Quantifiers
	September 21	Section 2.1 – Basic Concepts of Set Theory, <b>Quiz II</b>
Week 5	September 24	Section 2.2 – Set Operations, Review
	September 28	<b>Exam I</b>
Week 6	October 1	Section 2.3 – Extended Set Operations and Indexed Families of Sets
	October 5	Sections 2.4 – Induction
Week 7	October 9	<b>NO CLASS</b>
	October 12	Sections 2.5 – Equivalent Forms of Induction, <b>Quiz III</b>
Week 8	October 15	Section 2.6 – Principles of Counting
	October 19	Section 3.1 – Cartesian Products and Relations
Week 9	October 22	Section 3.2 – Equivalence Relations
	October 26	Section 3.3 – Partitions, <b>Quiz IV</b>
Week 10	October 29	Section 3.4 – Ordering Relations , Review
	November 2	<b>Exam II</b>
Week 11	November 5	Section 4.1 – Functions as Relations
	November 9	Sections 4.2 – Constructions of Functions
Week 12	November 12	Sections 4.3 – One-to-one and Onto Functions
	November 16	Section 4.4 – Images of Sets, <b>Quiz V</b>
Week 13	November 19	Section 4.5 – Sequences
	November 23	<b>NO CLASS</b>
Week 14	November 26	Section 5.1 – Equivalent Sets; Finite Sets
	November 30	Sections 5.2 – Infinite Sets
Week 15	December 3	Section 5.3 – Countable Sets
	December 7	Section 5.4 – The Ordering of Cardinal Numbers Review, <b>Quiz VI</b>
Week 16	December 10	Review