# Syllabus for Math 245, *Introduction to Proof via Discrete Math*, Spring 2016

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**Office Hours:** MWF 10:00am-11am, and by appointment.

**COURSE GOALS:** Math 245 is a "bridge course" designed to be a transition for math majors and minors from the computational courses like calculus, to the proof based courses such as number theory and analysis. In this course we will study logic, sets and relations, proof techniques, and discrete math. It is hoped that by the end of the course, you will read, write and think mathematics like a mathematician. Specific topics include mathematical induction, combinatorics, cardinality and Pascal's triangle.

**REQUIRED TEXT:** *Doing Mathematics: An Introduction to Proofs and Problem Solving*, Stephen Galovich

**SUPPLEMENTAL TEXTS:**
> *LaTeX: A Document Preparation System*, Leslie Lamport
> *Mathematics: A Discrete Introduction*, E. Scheinerman
> *How to Prove It: A Structured Approach*, D. Velleman
> *A Transition to Advanced Mathematics*, Smith, Eggen and St. Andre
> *A Discrete Transition to Advanced Mathematics*, Richmond and Richmond
> *Foundations of Higher Mathematics*, Fletcher and Patty

Note: These books are for reference only. You do not need to purchase any of them.

**GRADING:** The grading will be assigned the following scale:
> A: 90-100%
> B: 80-89%
> C: 70-79%
> D 60-69% F: Below 60%

There will be no curves and no extra credit. I will assign +/- on an individual basis. WF's will not be assigned. Points are assigned as follows:

> Quizzes (10) - 100 points
> Midterm exams (2) - 100 points each
> Homework - approximately 100 points
> Final exam - 200 points

**QUIZZES:** There will be a 10 point quiz each Friday. This quiz will cover material through the previous class. Quiz questions will consist mainly of definitions, theorems, short answers, and short proofs. The 10 best quiz scores will be kept, and the rest will be dropped. There will be no make up quizzes given. The quizzes are a good way for you to gauge your understanding of the current material and to keep up with the homework.

**MIDTERMS and FINAL:** There will be two midterms during the semester worth 100 points each and a final exam worth 200 points. The questions on the exams will be similar to homework questions and will contain proofs. If you cannot make it to a scheduled exam, you MUST contact the instructor BEFORE the exam if at all possible, or if an emergency, WITHIN 24 HOURS after the exam if you need to schedule a make up exam. Make up exams will only be given for extreme excuses. A doctor's note or some other physical excuse is required. Dates for exams (subject to change):

> Midterm I - Friday February 19
> Midterm II - Friday April 8
> **Final Exam** - Monday May 2, 8:00-10:00am

**LATEX:** As part of our objective to "write" mathematics (as well as to learn it and to speak it) we will learn to use the mathematical typesetting program LATEX. LATEXis the standard typsetting tool of mathematicians all over the world. Whether you will be teaching, working in business or in academia, LATEXwill be useful for preparing mathematical documents. See my website for information on installing and running LATEX.

**HOMEWORK:** Homework will be assigned after each section. We will discuss the homework, but most of it will not be collected. About once a week or so I will assign problems to be typed in LATEXand handed in for grading. Late assignments will not be accepted. In addition, during the semester, you will be required to present a proof to me in my office on the blackboard.

**CLASS STRUCTURE:** Each Friday there will be a quiz during class. Homework problems will be discussed at the beginning of class as time allows. The rest of the class will be lecture.

**ADDITIONAL HELP:** You are encouraged to work together in this class and form study groups. TALK about mathematics with each other. WRITE down your thoughts and ideas. SHARE these ideas with your group and with the class. Go to the library or internet and research topics that interest you or are difficult for you. The supplementary texts listed above are a starting place. You are welcome to e-mail questions to me, but if you are referring to a homework problem, please include the entire question, because I may not have access to a book when I answer your e-mail.

**HONOR CODE** You are to abide by the JMU honor code at all times. Ignorance of the law is no excuse. Cheating will not be tolerated and will be prosecuted to the fullest extent. When turning in homework, you may work together and discuss the problems, but you must write up the homework to turn in **by yourself**. Every answer requires an explanation, and no two people's explanations will be exactly the same. Copying someone else's homework or copying from the internet and putting your name on it is a violation of the Honor Code. Do not share your LATEXcode with anyone. You are welcome to discuss code, but do not share files.

## Math 245 Spring 2016 VERY tentative outline

Week 1 **January 11-15** Class overview, introduction to LaTeX, 1.1-1.2

Week 2 **January 18-22** No class Monday, MLK Day. Sections 2.1 Truth Tables, 2.2 Sets

Week 3 **January 25-29** Sections 2.3 Quantifiers, 3.1 Direct Proof

Week 4 **February 1-5** Section 3.2 Indirect Proof, Section 3.3 Induction

Week 5 **February 8-12** 3.4 Case Analysis, Section 3.5 Attacking the problem

Week 6 **February 15-19** Catch up, review, Midterm I, Ch 1, 2, 3

Week 7 **February 22-26** Sections 3.6 Looking Back, 4.1 Set Operations

Week 8 **Feb 29 - March 4** Sections 4.2 Relations, Sections 4.3 Functions

**March 7-11** Spring Break

Week 9 **March 14-18** 4.4 Equivalence Relations, Sections 5.1 Equinumerous Sets

Week 10 **March 21-March 25** Sections 5.2 Finite Sets, 5.3 Denumerable Sets

Week 11 **March 28-April 1** Sections 5.4 Uncountable Sets

Week 12 **April 4-8** Catch up, Review, Midterm II Ch. 4, 5

Week 13 **April 14-16** Sections 6.1 Combinatorics, 6.2 Permutations and Combinations

Week 14 **April 21-23** Sections 6.3 Binomial Theorem, 4.5 Natural/Rational Numbers

Week 15 **April 25** Sections 4.6 Real/Complex Numbers
**Wednesday April 27** Review **Last Day of Class**

Week 16 **Monday May 2** **Final Exam** 8:00am-10:00am