Transition to Advanced Mathematics Math 111, Fall 2014 Course Web Page: http://zimmer.csufresno.edu/~doreendl/111.14f

Instructor: Doreen De Leon

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Texts (required): *Book of Proof*, Second Edition, by Richard Hammack, http://www.people.vcu. edu/~rhammack/BookOfProof (free online or .pdf download, hard copy \$13.75 from Amazon or Barnes and Noble).

Units: 3.

Prerequisites: Math 76.

Meeting Time and Location: MW 3:30-4:45 in S 141.

Catalog Description: Introduction to the language and problems of mathematics. Topics include set theory, symbolic logic, types of proofs, and mathematical induction. Special emphasis is given to improving the student's ability to construct, explain, and justify mathematical arguments.

Course Objectives

To learn:

- the importance of formal, rigorous proofs;
- when it is sufficient to give an example/counterexample and when an arbitrary element of a set must be considered;
- set operations (intersection, union, difference, complement), and their properties;
- the meaning of logical operations (and, or, negation, implication) and quantifiers (universality and existence);
- the difference between different types of proof (direct, by contrapositive, by contradiction, by example/counterexample, etc.);
- the divisibility properties of integer numbers; congruences; basic properties of rational and irrational numbers;
- the notions of relation and equivalence relation; properties of equivalence classes;
- the notions and properties of one-to-one, onto, bijective, and inverse functions;
- formal definitions and proofs involving limits and continuity; and
- the Principle of Mathematical Induction.

Learning Outcomes

Upon completion of this course, students should be able to:

- use logical operators and quantifiers to write mathematical statements;
- use the principle structures in mathematics, including sets, equivalence relations, congruences, and functions; and
- prove simple mathematical statements using one of the proof techniques learned in this class.

Grading

Your grade will be based on the following percentage weights: 25% for the homework assignments, 15% for each of the three midterms, and 30% for the final exam. Grades on each individual homework assignment and exam will be given as a total number of points out of a specified maximum. Your final grade in the class will be computed from your weighted average, scaled to a maximum of 100 points.

The tentative breakdown of points for your final grade is as follows:

Grade	$\mathbf{Points}, \mathbf{p}$
А	$p \ge 90$
В	$80 \le p < 90$
С	$70 \le p < 80$
D	$60 \le p < 70$
\mathbf{F}	p < 60

Exams

There will be three midterms and one final exam. Calculators will not be permitted on any of the exams. The exam schedule is as follows:

- Midterm I: Monday, September 29, 2014
- Midterm II: Monday, October 27, 2014
- Midterm III: Monday, November 24, 2014
- Final Exam: Wednesday, December 17, 2014, 5:45 7:45 p.m.

Each midterm will be returned and discussed in the lecture following the exam. If you wish to request a regrade, you must submit a signed written request and return your exam to the instructor before leaving that lecture. No regrades will be allowed after you leave class, with the exception of mistakes in totaling scores. A missed exam is graded as a score of 0 unless prior arrangements have been made with the instructor.

Attendance

Although attendance is not required, it is **strongly suggested**. You should attend every class and be prepared to discuss the current material and the homework. This means that you should read the relevant section of the text before coming to class. If you miss a class, it is **your** responsibility to check on announcements made while you were absent.

Study Expectations

It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Since this is a 3 unit class, you should expect to study an average of 6 hours outside of class each week. Some students may need more outside study time and some less.

In this class, it is essential to supplement the lectures by carefully reading the text. For success with homework, and in general with this class, you should read the section in the text first, taking notes. You should carefully review the examples and write down any questions you have on the reading for discussion in lecture.

Homework

Homework will be assigned approximately every Wednesday and due the following Thursday at 4:30 p.m. by e-mail. More problems may be assigned than will be graded. The problems that will be graded

will be chosen by the instructor each week, but will not be announced until after the homework has been graded. Homework assignments will be announced in class and posted on the class web page. No late homework will be accepted.

All homework assignments must be typeset using IAT_EX and the source code (i.e., the .tex file) must be submitted to the instructor electronically via e-mail. You should title your IAT_EX file for each homework assignment as follows: the first letter in the name should be the first letter of your first name, the second part of the file name should be your last name, followed by an underscore (_), and then "hw" followed by the number. For example, if I were submitting Homework #1, the file would be entitled: ddeleon_hw1.tex.

NOTE: If the instructor cannot types et your .tex file, your score on the assignment will automatically be a 0.

The homework is the most important part of the course. Regardless of how well you think you understand the material in class, you will not really learn the material until you do the problems. You should develop a strategy for learning the material in this class. This may involve working in a group with other students or studying alone. You will get the maximum benefit from the homework if they attempt to do all of the problems themselves before consulting others. Regardless of your study strategy, your homework should represent your own work. It should be your own solution, expressed in your own words, even if you worked with others to get the solution. Remember, the purpose of the homework is to help you learn the material. You don't want to defeat the purpose of the homework. You are encouraged to consult the instructor for help in completing your assignments.

Classroom Behavior

In order to maintain a respectful learning environment, please: (1) make sure that all cell phones and pagers are turned off for the duration of class, and (2) do not talk, whisper, or engage in other distracting behavior. Such behavior includes chewing gum, sending/receiving text messages, and using a computer for any purpose other than taking notes. Any student conduct which disrupts the learning process will not be tolerated and may lead to removal from class and/or other disciplinary action. University policies on disruptive behavior are followed and enforced in every instance. See http://www.fresnostate.edu/academics/documents/RequiredSyllabusPolicyStatements_001.doc for more information on the University policy on disruptive classroom behavior.

Important Dates

- Sept. 1 Labor Day no classes
- Sept. 19 last day to add or drop classes without a serious and compelling reason
- Nov. 11 Veteran's Day no classes
- Nov. 20 last day to drop/withdraw from classes for serious and compelling reasons
- Nov. 26-28 Thanksgiving recess no classes
- Dec. 10 Last day of instruction
- Dec. 11 & 12 Final exam preparation and faculty consultation days

This syllabus and schedule are subject to change in the event of extenuating circumstances.

Tentative Course Schedule

Date	Topics	Sections
Aug. 25	Introduction to Sets; The Cartesian Product	1.1-1.2
Aug. 27	Subsets; Power Sets	1.3-1.4
Sep. 1	Labor Day	
Sep. 3	Union, Intersection, Difference; Complement; Venn Diagrams	1.5-1.7
Sep. 8	Indexed Sets; Number Systems; Logic Statements	1.8-1.9, 2.1
Sep. 10	And, Or, Not; Conditional and Biconditional Statements	2.2-2.4
Sep. 15	Truth Tables; Logical Equivalence	2.5-2.6
Sep. 17	Quantifiers; More on Conditional Statements;	2.7-2.8
Sep. 17	Translating English to Symbolic Logic	2.9
Sep. 22	Negating Statements; Logical Inference	2.10-2.11
Sep. 24	Counting Lists; Factorials; Counting Subsets	3.1-3.3
Son 20 Midterm I		Ch. 1-2, Sec. 3.1-3.3
bep. 29	Binomial Theorem	3.4
Oct 1	Review Midterm I	
	Inclusion-Exclusion	3.5
Oct. 6	Theorems; Definitions; Direct Proof	4.1-4.3
Oct. 8	Direct Proof; Using Cases; Testing Similar Cases	4.3-4.5
Oct. 13	Contrapositive Proofs; Congruence; Mathematical Writing	5.1-5.3
Oct. 15	Proof by Contradiction	6.1-6.3
Oct. 20	Proving Non-Conditional Statements	7.1-7.3
Oct. 22	Catch up and Review	
Oct 27	Midterm II	Sec. 3.4-3.5; Ch. 4-6
Oct. 27	Proofs Involving Sets	8.1
Oct 20 Review Midterm II		
000.23	Proofs Involving Sets	8.1-8.3
Nov. 3	Disproofs; Introduction to Induction	9.1-9.3; 10.0
Nov. 5	Introduction to Induction; Fibonacci Numbers	10.0, 10.3
Nov. 10	Proof by Strong Induction; Proof by Smallest Counterexample	10.1-10.2
Nov. 12	Introduction to Relations; Properties of Relations;	11.0-11.1
	Equivalence Relations	11.2
Nov. 17	Equivalence Classes; Integers Modulo n ;	
	Relations Between Sets	11.3-11.5
Nov. 19	Functions; Injective and Surjective Functions	12.1-12.2
Nov. 24	Midterm III	Chapters 7-11
	Injective and Surjective Functions	12.2
Nov. 26	Thanksgiving Break	
Dec. 1 Review Midterm III		
	Injective and Surjective Functions	12.2
Dec. 3	The Pigeonhole Principle; Composition	12.3-12.4
Dec. 8	Inverse Functions; Image and Preimage	12.5-12.6
Dec. 10	Cardinality	13.1-13.2
Dec. 12	Faculty Consultation Day	

Final Exam in this Course: Wednesday, December 17, 2014, 5:45 - 7:45 p.m.

Honor Code

The Honor Code, which requires all members of the CSU Fresno academic community to adhere to principles of academic integrity and mutual respect while engaged in university work and related activities, can be found at http://www.fresnostate.edu/aps/documents/apm/236.pdf. You should:

- (1) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration);
- (2) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as a basis of grading; and
- (3) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Cheating and Plagiarism

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Students with Disabilities

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services for Students with Disabilities (located in the Henry Madden Library, Room 1202 (278-2811)) for specific arrangements and information.

Computers

At California State University, Fresno, computers and communication links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.fresnostate.edu/ITS/) or the University Bookstore. Students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources.

Copyright Policy

For the required syllabus statements referring to copyright policy, please see the Required Syllabus Policy Statements page

(http://www.fresnostate.edu/academics/documents/RequiredSyllabusPolicyStatements_001. doc).