

The University of Texas – Rio Grande Valley
Syllabus for Math 3350.01: Intro to Math Proof Spring 2025
EMAGC 2.410 MW 11:00–12:15

Contact information

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Course information

Prerequisites: MATH 2318 with a grade of 'C' or better.

Corequisites: None.

Course Description: This course will prepare the student for advanced mathematics courses that require the writing of proofs. It reviews various elementary proof methods and the logical structure underlying them. It examines the formal definitions and basic properties of the mathematical structures that one encounters when constructing proofs, and it recounts famous theorems concerning these structures that every mathematician should know. Students are expected to construct non-routine mathematical proofs independently and to present their work in written form clearly and precisely. Substantial written work is required.

Course modality: The course will be delivered in the face-to-face format, in person, on campus, and on set schedules – the traditional way on the whiteboard. For students that cannot attend class due to safety concerns, remote attendance will be facilitated with asynchronous prerecorded lectures that will be made available to all students via Blackboard. Attendance will be tracked via weekly submission of homework on the Discussion Forums. Exams will be given in take-home format and will be distributed and collected via Blackboard, and returned via email. In case of an emergency, I may have to lecture online, but will do my best to keep that at minimum and be there for you in the classroom.

Textbook

- (1) E. Gkioulekas: "Lecture Notes on Introduction to Mathematics Proof", *Online Lecture Notes on Mathematics*, Edinburg, University of Texas Pan American (2009), 172 pp.
 - Open Educational Resource
 - This document can be downloaded as a pdf file, at no cost, from <https://faculty.utrgv.edu/eleftherios.gkioulekas/Teaching/notes.html>

Outline of Topics

- **Sets and Logic**
 - Propositions and truth tables
 - Boolean Algebra
 - Application to inequalities
 - Sets – Definitions
 - Proving set properties
 - Predicates and quantified statements
 - Quantified statements and Euclidean Geometry
 - Indexed set collections
 - Defining sets by description
 - Proof methodology with sets
- **Exam 1**
- **Integers**
 - Definitions – odd and even integers
 - Well-ordering principle
 - Divisibility
 - Method of induction
- **Exam 2**
- **Relations and Functions**
 - Cartesian product
 - Relations
 - Equivalence relations and equivalence classes
- **Mappings and Functions**
 - Basic definitions
 - One-to-one mappings/functions
- **Exam 3**
 - Function Monotonicity
 - Algebra and Properties of mappings/functions
 - Mapping composition
 - Inverse mappings
- **Exam 4**
 - Cardinality
 - Cardinality inequalities
 - Cardinal numbers

Grading Policies

- **Grading:** There will be 4 major exams, and a comprehensive final exam. The time and location of exams will be announced in class. Exams count for 80% and final exam for 20% of your grade. Combined, you get a numerical grade on a scale 0-20. Each exam question is graded on a 0-4 scale with 4 = A, 3 = B, 2 = C, 1 = D, 0 = F. Combining all exams, as explained above, gives a weighted average score on a 0-20 scale. This score is then mapped to a letter grade as follows: A: 16-20; B: 12-16; C: 10-12; D: 7-10; F: 0-7. There will be no curve and no extra credit.
- **Explanation of grades:** Your exams are graded question by question on a 0-4 scale per question. Overall, if you are planning to take future Mathematics or STEM courses, I would like to see you score 3 or 4 on all questions on all major examinations. If you score less than that on any questions, it indicates weaknesses in understanding the material. You should be proactive about addressing these weaknesses.
- **Missed exams:** If a major exam is missed during an excused absence, your score for that exam will be replaced with your final exam score.
- **Homework:** Homework will be assigned and will be collected via Blackboard discussion forums on a weekly basis. It is crucial to do the homework as part of your preparation for the exams. To keep up, I recommend that **after every lecture you should solve the homework problems corresponding to the material covered on that day's lecture. Thus you need to work on a continuous basis!** Maintain a well-organized written record of your homework solutions by **writing the statement of each problem** (so that your document is stand-alone and can be read by itself), followed by your detailed solution, and clearly indicate the problem, section, and chapter number of the question. Most homework problems require more than simply writing the answer, and so you must write all steps of your solution and provide appropriate justification, as illustrated by the instructor's solved examples, as you would on a test. Write neatly and legibly, using rigorous mathematical notation. While you are encouraged to discuss homework problems with other students, tutors, your instructor, and other faculty, the write-up of your solutions must be your own work and not simply copied from another student or another source. Use a ring binder to collect your homework, and write with a black pen, as that will help you to later scan the ring binder as a PDF file, for possible future use, and as a form of backup. This will provide you with a readily available resource to prepare for tests and quizzes, as well as providing documentation of the homework problems should you have a question about a problem and seek help from the instructor or a tutor.
- **Make-ups:** There are no make-up exams. In the case of **excused** absences the final exam will be used as a make-up exam. **Each student MUST take the final exam at the scheduled date and time.** There will be no make-ups for the final exam, after the official final exam date!
- **Regrading policy:** If you believe that a mistake in grading has been made you may request that your paper be regraded. Such request must be submitted **in writing** within one week from the day the graded test has been returned in class, and must be accompanied by the original (unaltered) paper. If you make any changes to the paper your request will be denied. Please note that if you request regrading, all problems are subject to review. Thus, your overall grade may be increased or decreased.

Attendance Policy

- **Attendance Policy:** Due to the asynchronous online modality of the course, attendance will be assessed with your participation in the discussion forums where you are expected to upload and discuss your solutions to the weekly homework assignments. The instructor has the prerogative to drop any student with four (4) or more unexcused absences, with each absence corresponding to failing to submit a homework assignment. The submitted homework should reflect a sincere effort to solve as many of the assigned homework problems as possible. **If you miss any major exam, you will be dropped from the course.**
- **How to Excuse an Absence:** To excuse an absence, you must notify the instructor **in writing** and attach **documentation**, before the date you will be absent, or no more than **three (3)** business days after the date. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service.

Other Policies

- **Extra Help:** You are strongly encouraged to form a study group with two or three of your classmates. The group should have no more than 4 students. The group will serve to help each other in doing homework, studying for tests, and whenever possible, teaching each other. The idea is to help each other keep up with the class and hopefully, be successful.

- (1) Contact your instructor during their office hours.
 - (2) Get free Math tutoring from Learning Assistance Center (LAC) building in Room 114 phone # 665-2532. (Edinburg Campus)
 - (3) Get free Math tutoring from Math Lab in Math building (MAGC) in room MAGC 1.106 (Edinburg Campus)
 - (4) Visit the Math Tutoring Lab at SETB 1.408 (Brownsville Campus)
 - (5) Visit the Math and Natural Sciences Learning Center at Cavalry Hall; Phone number: (956) 882-7058, (956) 882-8208 (Brownsville Campus)
 - (6) Additional tutoring support is available via the UTRGV Mathematics Society in EMAGC 2.312.
- **Calculators:** The problems you will encounter in my exams will not require a calculator, and you are better served in the long-term by minimizing your dependence on calculators. Don't use the calculator to approximate roots, exponentials, logarithms, etc. Mathematical problems require **exact** answers. Approximations are reasonable **only** on application problems where the numbers given may be approximate themselves, and thus the best answer that can be deduced is unavoidably approximate.
 - **Classroom Conduct:** Common courtesy requires that students arrive in class on time, and stay the entire class period. Turn your cellphones and pagers off. You are required to treat your classmate and instructor with respect and courtesy. Use of any electronic devices, except for calculators, is not allowed in class, and I reserve the option to remove you from the classroom without warning for any behaviour that I deem as disrespectful or disruptive. You agree to indemnify and hold harmless the professor with respect to all actions undertaken by the professor to enforce classroom conduct or to properly proctor exams. Taking my course implies your consent to this policy.
 - **Scholastic dishonesty:** As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced.

Technical Requirements

- **Computer Hardware:** To participate in this course, you should have easy access to a computer less than 5-years old with high-speed internet connection via cable modem, LAN or DSL. It is strongly recommended that you also have a printer (to print lecture notes) and scanner (to scan homework and take-home exams).
- **Student Technical Skills:** You are expected to be proficient with installing and using basic computer applications and have the ability to send and receive email attachments.
- **Software:**
 - Mozilla's Firefox or Google Chrome
 - Adobe Acrobat
 - Zoom
 - Media player software (e.g. Quicktime, Windows Media Player, etc.)
 - Virus protection Software
 - Microsoft Word or TeXLive
- **Blackboard Support Contact Information:** If you need Blackboard support at any time during the course or to report a problem with Blackboard you can:
 - Visit the Blackboard Student Help Site: <https://help.blackboard.com/Learn/Student>
 - Submit a Blackboard Help Ticket: <http://utrgv.edu/coltthelp>
 - Need Blackboard assistance after hours? You can call our main office numbers, 956-882-6792 or 956-665-5327, to speak with a support representative.

Document Scanning

- Take home exams and homework assignments should be submitted as ONE PDF file per submission. Name your file: **Lastname-Firstname.pdf** using your First and Last name.
- **DO NOT JUST TAKE PHOTOGRAPHS OF YOUR PAPERS WITH A PHONE!!!! DON'T SEND ME IMAGE FILES!!! I need a PDF document that can be printed, and just taking pictures will not work.**

- **WRITE WITH A DARK PEN. DO NOT USE A PENCIL, ESPECIALLY A LIGHT ONE.** Your document may be barely readable on screen but not print well.
- **I won't be able to grade an exam that looks unreadable on paper.**
- To scan with a printer/scanner, please use the following settings:
 - 400 dpi (less than 300dpi will not look good)
 - Black and White
 - Scan as PDF file
 The printer/scanner will then create a pdf file.
- To scan with a phone **YOU MUST USE A SCANNING APP.** For both Android phones and iphones, I recommend using Mobile Doc Scan. To use the app, you take a photograph of the paper and then adjust the bounding box to the four corners of your paper. Image processing algorithms then produce an image that looks as if you fed the document through a real scanner. You need to do this for each page, so this is less convenient than an actual scanner. The app can be used to generate a PDF file, which you can then transfer to a computer and submit by email.

Mathematics Major Student Learning Outcomes

Students completing the B.S. program in Mathematics will:

- (1) Demonstrate in-depth knowledge of Mathematics, its scope, application, history, problems, methods, and usefulness to mankind both as a science and as an intellectual discipline.
- (2) Demonstrate a sound conceptual understanding of Mathematics through the construction of mathematically rigorous and logically correct proofs.
- (3) Identify, formulate, and analyze real world problems with statistical or mathematical techniques.
- (4) Utilize technology as an effective tool in investigating, understanding, and applying mathematics.
- (5) Communicate mathematics effectively to mathematical and non-mathematical audiences in oral, written, and multi-media form.
- (6) Demonstrate an appreciation of and enthusiasm for lifelong scientific inquiry, learning, and creativity.

Student Learning Outcomes

After completing this course students will be able to

- (1) Master the basic techniques and strategies used in mathematical proofs and understand the logical structure of mathematical proofs and associated constructs.
- (2) Write mathematical arguments in clear, precise, and correct English.
- (3) Understand sets, Boolean logic, and quantified statements, and how to prove set theory statements involving set relations, properties of set operations, and indexed set collections.
- (4) Write proofs involving odd/even integers, the well-ordering principle, divisibility, and the method of induction.
- (5) Learn the definition and properties of the cartesian product, relations, equivalence relations, and equivalence classes.
- (6) Write proofs about mappings and functions, specifically studying one-to-one mappings, function monotonicity, algebra and properties of functions, mapping composition, and the mapping inverse.