

# Syllabus

|             |                                       |
|-------------|---------------------------------------|
| Title       | Real Analysis I                       |
| Number      | MATH 5305-162                         |
| Time        | TR 5:30–6:45                          |
| Place       | Pellegrino 112                        |
| Instructor  | David Milovich                        |
| Email       | david.milovich@tamiu.edu              |
| Phone       | (956) 326-2570                        |
| Office      | BVC 321                               |
| Hours       | MW 5:00–6:30 and TR 3:30–5:00         |
| Department  | Engineering, Mathematics, and Physics |
| College     | Arts and Sciences                     |
| Institution | Texas A&M International University    |
| Term        | Fall 2014                             |

**Course description.** This is a course on Lebesgue measure and integration. The classical  $L^p$  spaces will be defined and basic results established, such as the Holder and Minkowski inequalities and completeness of the spaces. Prerequisites: Graduate standing and permission of instructor.

**Student learning outcomes.** Upon successful completion of this course, the student will be able to:

- explain the concepts of measurable sets, measurable function and measure;
- define the concept of Lebesgue Measure and Lebesgue Integral;
- explain the difference between the Lebesgue Integral and the Riemann Integral;
- distinguish between uniform convergence and pointwise convergence, and apply the Lebesgue dominated convergence theorem to prove convergence of integrals and the continuity of basic integral transforms, such as the Fourier Transform;
- explain the definition of  $L^p$  spaces, the Riesz representation theorem, and the completeness of the  $L^p$  spaces;
- explain the definition of the derivative of a measurable function; and
- explain how to construct measure theory in spaces other than the real line.

**Textbook.** Required: *Introduction to Measure Theory* and Volume 1 of *An Epsilon of Room* by Terrance Tao. (The free online editions are acceptable substitutes for the print editions.)

**Homework.** Homework is worth 50% of your grade and will be due roughly biweekly, with assignments progressively made daily.

**Presentation.** During the last three class days of November, each student will give an in-class presentation on an advanced topic chosen with instructor approval. The presentation is worth 25% of your grade.

**Tests.** The final exam is worth 25% of your grade. The exam will consist of some problems selected from the homework assignments. Notes and books are not permitted for the final exam.

**Grading.**

| letter | score of $x\%$   |
|--------|------------------|
| A      | $90 \leq x$      |
| B      | $80 \leq x < 90$ |
| C      | $70 \leq x < 80$ |
| D      | $60 \leq x < 70$ |
| F      | $0 \leq x < 60$  |

| Sequence | Date   | Day | HW due | Topics   |
|----------|--------|-----|--------|--|
| 1        | 28-Aug | R   |        | the problem of measure                                 |
| 2        | 02-Sep | T   |        | the problem of measure                                 |
| 3        | 04-Sep | R   |        | Lebesgue measure                                       |
| 4        | 09-Sep | T   |        | Lebesgue measure                                       |
| 5        | 11-Sep | R   | 1—3    | The Lebesgue integral                                  |
| 6        | 16-Sep | T   |        | The Lebesgue integral                                  |
| 7        | 18-Sep | R   |        | Examples   |
| 8        | 23-Sep | T   |        | Abstract measure spaces and convergence theorems       |
| 9        | 25-Sep | R   | 4—7    | Abstract measure spaces and convergence theorems       |
| 10       | 30-Sep | T   |        | Modes of convergence                                   |
| 11       | 02-Oct | R   |        | Differentiation theorems                               |
| 12       | 07-Oct | T   |        | Differentiation theorems                               |
| 13       | 09-Oct | R   | 8—11   | outer measures   |
|          | 14-Oct | T   |        | (no class)   |
| 14       | 16-Oct | R   |        | pre-measures   |
| 15       | 21-Oct | T   |        | product measures                                       |
| 16       | 23-Oct | R   | 12—14  | Fubini-Tonelli Theorems                                |
| 17       | 28-Oct | T   |        | Signed measures and the Radon-Nikodym-Lebesgue theorem |
| 18       | 30-Oct | R   |        | $L^p$ spaces   |
| 19       | 04-Nov | T   |        | Hilbert spaces   |
| 20       | 06-Nov | R   | 15—18  | Hilbert spaces   |
| 21       | 11-Nov | T   |        | The Fourier transform                                  |
| 22       | 13-Nov | R   |        | The Fourier transform                                  |
| 23       | 18-Nov | T   |        | student presentations                                  |
| 24       | 20-Nov | R   |        | student presentations                                  |
| 25       | 25-Nov | T   |        | student presentations                                  |
| 26       | 02-Dec | T   | 19—22  | Review   |
|          | 09-Dec | T   |        | final exam, 5PM—8PM                                    |



# **Policies of the College of Arts and Sciences**

(Required on all COAS Syllabi)

## **Classroom Behavior**

The College of Arts and Sciences encourages classroom discussion and academic debate as an essential intellectual activity. It is essential that students learn to express and defend their beliefs, but it is also essential that they learn to listen and respond respectfully to others whose beliefs they may not share. The College will always tolerate diverse, unorthodox, and unpopular points of view, but it will not tolerate condescending or insulting remarks. When students verbally abuse or ridicule and intimidate others whose views they do not agree with, they subvert the free exchange of ideas that should characterize a university classroom. If their actions are deemed by the professor to be disruptive, they will be subject to appropriate disciplinary action, which may include being involuntarily withdrawn from the class.

## **Plagiarism and Cheating**

Plagiarism is the presentation of someone else's work as your own. **1)** When you borrow someone else's facts, ideas, or opinions and put them entirely in your own words, you must acknowledge that these thoughts are not your own by immediately citing the source in your paper. Failure to do this is plagiarism. **2)** When you also borrow someone else's words (short phrases, clauses, or sentences), you must enclose the copied words in quotation marks as well as citing the source. Failure to do this is plagiarism. **3)** When you present someone else's paper or exam (stolen, borrowed, or bought) as your own, you have committed a clearly intentional form of intellectual theft and have put your academic future in jeopardy. This is the worst form of plagiarism.

Here is another explanation from the 2010, sixth edition of the *Manual of The American Psychological Association* (APA):

*Plagiarism:* Researchers do not claim the words and ideas of another as their own; they give credit where credit is due. Quotations marks should be used to indicate the exact words of another. *Each* time you paraphrase another author (i.e., summarize a passage or rearrange the order of a sentence and change some of the words), you need to credit the source in the text.

The key element of this principle is that authors do not present the work of another as if it were their own words. This can extend to ideas as well as written words. If authors model a study after one done by someone else, the originating author should be given credit. If the rationale for a study was suggested in the Discussion section of someone else's article, the person should be given credit. Given the free exchange of ideas, which is very important for the health of intellectual discourse, authors may not know where an idea for a study originated. If authors do know, however, they should acknowledge the source; this includes personal communications. (pp. 15-16)

Consult the Writing Center or a recommended guide to documentation and research such as the *Manual of the APA* or the *MLA Handbook for Writers of Research Papers* for guidance on proper documentation. If you still have doubts concerning proper documentation, seek advice from your instructor prior to submitting a final draft.

**Use of Work in Two or More Courses:** You may not submit work completed in one course for a grade in a second course unless you receive explicit permission to do so by the instructor of the second course.

**Penalties for Plagiarism:** Should a faculty member discover that a student has committed plagiarism, the student should receive a grade of 'F' in that course and the matter will be referred to the Honor Council for possible disciplinary action. The faculty member, however, may elect to give freshmen and sophomore students a "zero" for the assignment and to allow them to revise the assignment up to a grade of "F" (50%) if they believe that the student plagiarized out of ignorance or carelessness and not out of an attempt to deceive in order to earn an unmerited grade. This option should not be available to juniors, seniors, or graduate students, who cannot reasonably claim ignorance of documentation rules as an excuse.

**Caution:** Be very careful what you upload to Turnitin or send to your professor for evaluation. Whatever you upload for evaluation will be considered your final, approved draft. If it is plagiarized, you will be held responsible. The excuse that "it was only a draft" will not be accepted.

**Caution:** Also, do not share your electronic files with others. If you do, you are responsible for the possible consequences. If another student takes your file of a paper and changes the name to his or her name and submits it and you also submit the paper, we will hold both of you responsible for plagiarism. It is impossible for us to know with certainty who wrote the paper and who stole it. And, of course, we cannot know if there was collusion between you and the other student in the matter.

**Penalties for Cheating:** Should a faculty member discover a student cheating on an exam or quiz or other class project, the student should receive a "zero" for the assignment and not be allowed to make the assignment up. The incident should be reported to the chair of the department and to the Honor Council. If the cheating is extensive, however, or if the assignment constitutes a major grade for the course (e.g., a final exam), or if the student has cheated in the past, the student should receive an "F" in the course, and the matter should be referred to the Honor Council. Under no circumstances should a student who deserves an "F" in the course be allowed to withdraw from the course with a "W."

**Student Right of Appeal:** Faculty will notify students immediately via the student's TAMIU e-mail account that they have submitted plagiarized work. Students have the right to appeal a faculty member's charge of academic

dishonesty by notifying the TAMIU Honor Council of their intent to appeal as long as the notification of appeal comes within 5 business days of the faculty member's e-mail message to the student. The *Student Handbook* provides details

### **UConnect, TAMIU E-Mail, and Dusty Alert**

Personal Announcements sent to students through TAMIU's UConnect Portal and TAMIU E-mail are the official means of communicating course and university business with students and faculty – not the U.S. Mail and not other e-mail addresses. Students and faculty must check UConnect and their TAMIU e-mail accounts regularly, if not daily. Not having seen an important TAMIU e-mail or UConnect message from a faculty member, chair, or dean is not accepted as an excuse for failure to take important action. Students, faculty, and staff are encouraged to sign-up for *Dusty Alert* (see [www.tamtu.edu](http://www.tamtu.edu)). *Dusty Alert* is an instant cell phone text-messaging system allowing the university to communicate immediately with you if there is an on-campus emergency, something of immediate danger to you, or a campus closing.

### **Copyright Restrictions**

The Copyright Act of 1976 grants to copyright owners the exclusive right to reproduce their works and distribute copies of their work. Works that receive copyright protection include published works such as a textbook. Copying a textbook without permission from the owner of the copyright may constitute copyright infringement. Civil and criminal penalties may be assessed for copyright infringement. Civil penalties include damages up to \$100,000; criminal penalties include a fine up to \$250,000 and imprisonment.

### **Students with Disabilities**

Texas A&M International University seeks to provide reasonable accommodations for all qualified persons with disabilities. This University will adhere to all applicable federal, state, and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal education opportunity. It is the student's responsibility to register with the Director of Student Counseling and to contact the faculty member in a timely fashion to arrange for suitable accommodations.

### **Incompletes**

Students who are unable to complete a course should withdraw from the course before the final date for withdrawal and receive a "W." To qualify for an "incomplete" and thus have the opportunity to complete the course at a later date, a student must meet the following criteria:

1. The student must have completed 90% of the course work assigned before the final date for withdrawing from a course with a "W", and the student must be passing the course;
2. The student cannot complete the course because an accident, an illness, or a traumatic personal or family event occurred after the final date for withdrawal from a course;
3. The student must sign an "Incomplete Grade Contract" and secure signatures of approval from the professor and the college dean.
4. The student must agree to complete the missing course work before the end of the next long semester; failure to meet this deadline will cause the "I" to automatically be converted to a "F"; extensions to this deadline may be granted by the dean of the college.

This is the general policy regarding the circumstances under which an "incomplete" may be granted, but under exceptional circumstances, a student may receive an incomplete who does not meet all of the criteria above if the faculty member, department chair, and dean recommend it.

### **Student Responsibility for Dropping a Course**

It is the responsibility of the STUDENT to drop the course before the final date for withdrawal from a course. Faculty members, in fact, may not drop a student from a course without getting the approval of their department chair and dean.

### **Independent Study Course**

Independent Study (IS) courses are offered only under exceptional circumstances. Required courses intended to build academic skills may not be taken as IS (e.g., clinical supervision and internships). No student will take more than one IS course per semester. Moreover, IS courses are limited to seniors and graduate students. Summer IS course must continue through both summer sessions.

### **Grade Changes & Appeals**

Faculty are authorized to change final grades only when they have committed a computational error or an error in recording a grade, and they must receive the approval of their department chairs and the dean to change the grade. As part of that approval, they must attach a detailed explanation of the reason for the mistake. Only in rare cases would another reason be entertained as legitimate for a grade change. A student who is unhappy with his or her grade on an assignment must discuss the situation with the faculty member teaching the course. If students believe that they have been graded unfairly, they have the right to appeal the grade using a grade appeal process in the *Student Handbook* and the *Faculty Handbook*.

### **Final Examination**

Final Examination must be comprehensive and must contain a written component. The written component should comprise at least 20% of the final exam grade. Exceptions to this policy must receive the approval of the department chair and the dean at the beginning of the semester.