Mat 570 — Real Analysis I — Fall 2018

Line No.	73802
Time	TuTh 10:30-11:45 AM
Room	EDB L1-20
Instructor	Jack Spielberg
Instructor webpage	`http://math.asu.edu/~jss`
Office	WXLR-747
Phone	965-3286 (Math Department: 965-3951)
Office Hours	M 1:30 - 2:30, W 3 - 5, and by appointment.
e-mail	spielberg@asu.edu
Text	Folland, *Real Analysis, 2nd edition*, Wiley 1999.
Course webpage	`https://mathcms2.asu.edu/moodle/course/view.php?id=108`

Points	Homework	40%
	Midterm	20%
	Final Exam	40%

Dates	ASU Day 1	Aug 16, Thursday
	Drop/Add Ends	Aug 22, Wednesday
	Labor Day holiday	Sep 3, Monday
	Midterm	Oct 4, Thursday
	Fall Break	Oct 8 – 9, Monday – Tuesday
	Course Withdrawal Deadline	Oct 31, Wednesday
	Veteran's Day holiday	Nov 12, Monday
	Thanksgiving holiday	Nov 22 – 23, Thursday – Friday
	Last day of classes	Nov 30, Friday
	Final Exam	Dec 4, Tuesday, 9:50 - 11:40 am

Course Materials will be posted on Moodle, which is accessible at the link above. You should check there regularly for updated information. All information and policies in this syllabus are subject to change at the instructor's discretion. All changes will be announced in class and on Moodle.

For the first couple of weeks of the semester, I will also post course info on my webpage `http://math.asu.edu/~jss`.

Course Description. This is the first half of a year-long sequence in real analysis for graduate (and superior undergraduate) students in Mathematics. (There is a related, and independent, course, APM 503, that students in Applied Math take, and which covers similar material.) The sequence MAT 570-571 is preparation for the Qualifying Exam in Real Analysis for the PhD Program in Mathematics.

The first portion of the course will cover metric space topology and uniform properties of continuous functions. The second portion will initiate the study of abstract measure theory and integration. The spring semester will continue with measure and integration, and end with some connections between measure theory and topology.

For the first part of the course we will follow notes that I will provide on the course webpage. There are various excellent texts that may be used as supplemental reading (see later in this syllabus). For the second part, we will use the text of Folland (chapters 1 - 3). (Sheldon Axler has kindly allowed our class use of (part of) his forthcoming text on measure theory. I will post these on the course webpage. He asks that while you may use these yourself, please not to distribute them further.)

The course grade will be based on weekly problem sets, a midterm exam, and a final exam.

Prerequisites the same as for admission to the Math PhD program, namely "advanced calculus" (equivalent to MAT 371 at ASU) and linear algebra (equivalent to MAT 342). The specific advanced calculus requirement comprises a rigorous development of calculus on the real line, with complete proofs, and where students become proficient at constructing proofs of correct mathematical statements and counterexamples

to incorrect ones, and how to tell the difference. The linear algebra requirement constitutes abstract vector spaces over the real and complex numbers, linear transformations, and inner products.

Assistant. Menevse Eryuzlu has been assigned as the teaching assistant for this course. She too will have office hours.

Homework will be assigned weekly. The assignments will be posted on Moodle. Homework is due at the beginning of class on the due date (usually Thursday).

All homework problems require careful proofs. You should think of each assignment as a collection of essays. You must write in complete sentences, with punctuation, that show all of your reasoning. Mathematical and logical symbols should be confined to well-formed mathematical or logical phrases within complete sentences. Avoid using symbols as shorthand for words or phrases. (For example, the symbol $\Rightarrow$ must not be used in place of the word *implies*.)

The homework is the most important part of the course. You should expect to spend a lot of time on the homework. You are welcome to work together on the problems, but you must write up your solutions yourself, in your own words.

Google and other books. I urge you as strongly as I can to avoid looking for solutions to homework problems on the internet and in books (and anywhere else). The only value of the homework comes from banging your head against hard problems, over a period of several days – and sometimes being unsuccessful. Also, when you have a good idea, putting that into words, and then writing a careful proof, is an important and nontrivial part of the exercise. If you are really stuck after trying to do a problem, you are welcome to ask me for hints, either in my office or by email.

Always reread, and then recopy, your solutions before handing them in. If you type your solutions, rereading and recoding before submission is still crucially important.

Reading the homework is a time-consuming job too! Please make it easier for us to give you the score that you deserve by

- writing neatly, with large enough printing, and leaving space between lines
- not writing in the upper corners where pages will be stapled
- writing on only one side of each sheet
- STAPLING your papers BEFORE coming to class

You should take the point of view that paper is cheap. Use plenty of scratch paper when working out your solutions, and use plenty of paper to write (and rewrite) your solutions for submission.

Grading. Problems are "worth" 5 points each. The rough scale is: 3.5 = A, 2.5 = B, 1.5 = C.

Questions. I welcome questions at any time. Please don't hesitate to ask me during class if there is something that you don't understand or that you want to discuss. (The only exception is a question about the grading of your homework or exam. Please ask these questions after class, or in office hours.) You may also ask questions in office hours, or any other time that you catch me in my office (if I am too busy, we can set up another time). You may also ask questions by email.

Civility. As a courtesy to me and to the other members of the class, please turn off ALL devices that can make noise, before entering the classroom. Please arrive to class on time, and if you must leave before the end of class, do so as unobtrusively as possible. Do not send text messages or use audio players. **PLEASE DO NOT EAT DURING CLASS.**

References

Rosenlicht, *Introduction to Analysis*, Dover.
Rudin, *Principles of Mathematical Analysis, 3rd ed.*,
Tao, *Analysis II*, Hindustan Book Agency or Tao's blog.
Jones, *Lebesgue integration on Euclidean space*, Jones and Bartlett.

Tao, *Measure theory*, AMS or Tao's blog.

BOILERPLATE

Exam Policies. A missed midterm exam can be made up only in the case of a documented emergency, or because of a conflict with a university-sanctioned activity. In the latter case you must notify me well in advance (messages may be left through email, or in the main office (965-3951)), and provide me with a copy of your travel schedule and the name and phone number of the appropriate university sponsor. The University has an extremely strict policy regarding missed final exams. You may view this policy at the link for the final exam schedule: `http://students.asu.edu/final-exam-schedule`

We give the following excerpt:

> Except to resolve those situations described below, no changes may be made in this schedule without prior approval of the Dean of the college in which the course is offered . . . Under this schedule, if a conflict occurs, or a student has more than three exams on one day, the instructors may be consulted about an individual schedule adjustment. If necessary, the matter may be pursued further with the appropriate dean(s). This procedure applies to conflicts among any combination of Downtown Phoenix campus, Tempe campus, Polytechnic campus, West campus, and/or off campus class.

In particular, make-up exams will NOT be given for reasons of non-refundable airline tickets, vacation plans, work schedules, weddings, family reunions, and other such activities. Students should consult the final exam schedule before making end-of-semester travel plans.

CLAS Statement on Academic Integrity. Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see `http://provost.asu.edu/academicintegrity`.

CLAS Disability Policy Statement. Students who feel they will need disability accommodations in this class but have not registered with the Disability Resource Center (DRC) should contact DRC immediately. Their office is located on the first floor of the Matthews Center Building. DRC staff can also be reached at: 480-965-1234 (V), 480-965-9000 (TTY). For additional information, visit: `www.asu.edu/studentaffairs/ed/drc`.

ASU's policy against threatening behavior (Student Services Manual SSM 104-02 "Handling Disruptive, Threatening or Violent Individuals on Campus": `https://www.asu.edu/aad/manuals/ssm/ssm104-02.html`):

All incidents and allegations of violent or threatening conduct by an ASU student (whether on-or off campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances.