Linear Analysis

Math 675, Sander, Fall, 2020

Lecturer: Dr. E. Sander (*esander@gmu.edu*, (while possibly not useful my office is: Exploratory Hall, Rm 4408). Office hours: M 3:15 PM - 4:15 PM and W 3:15 PM - 4:15 PM.

GLA: Hannah Klawa (*hklawa@gmu.edu*). Office hours: M 4:15 PM - 5:15 PM and W 4:15 PM - 5:15 PM.

Lectures: The lectures will consist of videos posted on Blackboard, as well as active learning sessions on Zoom with the lecturer and/or the GLA on Mondays and Wednesdays during the scheduled classtime 5:55-7:10 pm:

- *Mondays* will be the synchronous portion of the course. This will be an active learning session with both the instructor and the GLA. Students will be working in groups on selected course material. This is a required part of the course.
- *Wednesdays* will be a problem session run by the GLA. This session will be an active learning session concentrating on preparation for the preliminary exam, and often the problems will be taken from old prelims. This session is optional. However, since these problems are quite similar to the course material, this session will also prove helpful to everyone in the class, and you are highly encouraged to attend.

Office hours: Both the lecturer and the GLA office hours are online for drop in no appointment needed.

Textbook: A. N. Kolmogorov, S. V. Fomin, *Introductory Real Analysis*, Dover Publications, 1970.
Supplementary book: Christopher Heil, *Introduction to Real Analysis*, Springer, 2019. (This book is available to GMU students for no extra cost as a download from the GMU library Springer ebooks.)

Prerequisite: A grade of B or better in MATH 315 (Advanced Calculus) or equivalent.

Course description: The goal of the course is to familiarize the student with some of the important concepts and techniques of modern linear and functional analysis. The emphasis will be on correct mathematical understanding and presentation of the concepts, and also on developing intuition. Examples of how the concepts presented in the course are used to solve practical problems will be given. The topics presented in the course will cover Chapters 2, 4, 5 and 6 of Kolmogorov and Fomin. In Heil, the relevant topics are mostly contained in Chapters 0, 1, 7, 8, 9. In particular, the course covers metric spaces, normed linear spaces, completeness, compactness, continuous (bounded) linear transformations, Banach spaces, Hilbert spaces, and orthogonal series.

Grading: Your grade will be based on homework assignments (30%), a midterm (30%), a final exam (35%), and attendance/participation at the active learning Zoom sessions (5%).

Test Dates

- Midterm: Tuesday, October 19.
- Final Exam: Tuesday, December 14, 4:30-7:15 (per official university schedule).

Homework: Homework will be posted and turned in on Blackboard. Written assignments are a vital part of this course. Here are some guidelines for turning in homework

1. Turn in homework on **Blackboard**. Make sure it is **on time**.
2. **Naming scheme**: Your homework must be called **"hwNUMBER-NAME.pdf"** For example, if your name is Jane Smith and you are turning in Homework 4, your filename is **"hw4-SmithJ.pdf"**
3. **Type your answer using LaTeX** and turn it in as a **PDF**. If you have never used LaTeX before, please consult the template provided and feel free to ask for help.
4. **Keep a copy** of your work in case of technical issues
5. Readability guidelines:
    1. Make your work clear, correct, and organized. This includes writing in **clear complete sentences using correct spelling and grammar**.
    2. Write each problem on a new page, and make sure the pages are in order.
    3. Do not send in a homework that is sideways in the PDF viewer.
    4. Do not adopt the attitude that says, "I don't really understand how to do this problem, so I will take a shot and see if I get any points." The GLA and lecturer are always willing to give hints if you are having trouble with any particular assignment.

Honor Code

- You may discuss homework problems with the lecturer, the GLA, or other students. However, the writeup must be entirely your own. This means that prior to handing it in *you do not show anyone else your written assignment, nor do you look at anyone else's writeup*.
- You may use sources other than the textbook to help you with your assignment, but then you must cite these sources.
- No collaboration of any kind is permitted on exams.
- Any violations will be brought ot the Honor Committee and result in a grade of F for all individuals involved. See The GMU Honor Code.

Other useful information: Please be considerate of other students in the class:

- During active learning sessions, please get to class on time and give this session your full attention.
- For those who have not used Latex before, there is an upcoming GMU math department session teaching Latex.
- When you should watch the videos: Watch the first video before the Monday session, and the second video before the Wednesday session.
- Under Blackboard Announcements, please find the Zoom invitation for the weekly meeting.

Other:

- When needed, accommodations can be made through the Office of Disability Services. See me if this is relevant.
- In order to help ensure the privacy of communications with students, faculty and students need to use their Mason email accounts when corresponding with each other.
- University Catalog: http://catalog.gmu.edu/
- University Policies: http://universitypolicy.gmu.edu/
- GMU has a number of academic support and other resources to facilitate student success. These include: Learning Services, University Career Services, the Writing Center, Counseling and Psychological Services (caps.gmu.edu), Student Health Services (shs.gmu.edu), the University Ombudsperson (ombudsman.gmu.edu), and Wellness, Alcohol and Violence Education and Services (waves.gmu.edu), University Title IX Coordinator (integrity.gmu.edu).
