Math776 Syllabus

Spring 2022 - Anton Lukyanenko - alukyane@gmu.edu

Class times: MW 5:55-7:10 in 4016 Exploratory Hall

Office hours: MW 3:30-5:55, in person in 4113 Exploratory Hall and online at
https://gmu.zoom.us/j/9860600799

Textbook: *Measure Theory* by Donald Cohn, second edition. Free download through the library.

Course content

We will cover chapters 1-7 of the book, followed by some applications and student presentations.

These chapters cover: measures, functions&integrals, convergence, signed&complex measures, product measures, differentiation, and measures on locally compact spaces.

Applications will focus on basic ergodic theory and applications to geometry and number theory.

End-of-semester student presentations will focus on a topic of the student's choice.

Course format: first 9-10 weeks

During the first phase of the course, we will aim to cover 2 sections per day; going faster or slower as needed as the semester progresses.

Before each class (3 hours) Students will read the next two sections of the book, work on the suggested homework problems (individually or in groups), and then write an informal summary including key ideas, points of confusion, homework problem ideas, and/or questions. This should be 1-2 pages in length.

In class I will start with a quick overview of the two sections, and then we will work in groups to discuss any points of confusion, share problem solutions, and solve additional problems.

After class (1 hour) Working in groups of 2-3 students, students will submit a finalized **1-page** summary of the two sections before the next class period. Students may take turns writing up the summary, but it must be approved by everyone in the group. Summaries may include suggestions for verbal assessment questions.

Badly-written or incomplete summaries will be frowned upon, and returned for rewriting.

Verbal Assessments Once we complete each pair of chapters (excluding ch. 7), a list of 10 questions will be announced. A week later, students will register for brief assessments during office hours.

During an assessment, 3 of the 10 questions will be selected at random. To pass the assessment, the student must correctly answer 2 of the questions and any clarification questions **in 10-minutes**.

A failed assessment can be retaken at no penalty at a future office hour, with newly-randomized questions. Assessments must be taken sequentially: chapters 1&2 passed before 3&4 attempted, etc.

A student failing two or more successive assessments will be required to follow a study plan and attend office hours before continuing.

Course format: last 4-5 weeks

In the second phase of the course, class will switch to interactive lectures on applications. No summaries will be submitted, and the material will not be assessed. That said, continued attendance and participation are expected.

The last week will be devoted to 20-minute student presentations, discussing a recent thesis of their choice that is related to measure theory and integration.

In preparation, students will submit 2-page answers to the following questions:

- (due April 11) What 3 theses are you considering reporting on? Provide a quick description of each one and attach a PDF of the thesis. Note that short theses are generally denser and harder to make sense of.
- (due April 25) Notes for your talk, to be shared with others in the class.

Attendance and Participation

Attendance and participation are expected. Students who are not feeling well should of course stay home. Attendance via zoom can be arranged, by request, in such cases.

Grading

All submissions will be made by email to alukyane@gmail.com.

*A*s will be given to students who submit all summaries, pass all assessments, give a good presentation, and participate actively in class.

Weak presentations or un-passed assessments will reduce the grade by 1/3 of a letter grade each (e.g. 1 passed assessment and a weak presentation leads to a B). Additional penalties will be imposed for lack of participation or unsubmitted summaries.