MAT 701 – Real Variables I – Fall 2018

Contact Information

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Office Hours: Mo, We 2:30-3:30; Tu, Th 1-2; Su 12-1. You can also see me at other times by appointment (made online at https://leonid.youcanbook.me).

Class Time and Location: MWF 11:40–12:35, Carnegie 110.

Course Content

Catalog Description: Measure and integration, including basic theorems on integration and differentiation of sequences of functions; modes of convergence, product measures. *Prereq.*: MAT 602.

Textbook: *Measure and Integral: An Introduction to Real Analysis, 2nd Ed.* Wheeden & Zygmund. Chapman and Hall/CRC. ISBN 9781498702898.

Course outline:

1. Lebesgue measure in R^n: outer measure, measurable and non-measurable sets, Lipschitz transformations. (7 class periods, sections 3.1–3.6)

2. Measurable functions in R^n: properties, modes of convergence, theorems of Egorov and Lusin theorems. (5 class periods, sections 4.1–4.4)

3. Lebesgue integral in R^n: properties, convergence theorems, relation to Riemann and Riemann-Stieltjes integrals. (6 class periods, sections 5.1–5.5)

4. Repeated integration in R^n: theorems of Fubini and Tonelli, applications. (4 class periods, sections 6.1–6.3)

5. L^p spaces in R^n: Hölder's and Minkowski's inequalities, sequence spaces, Banach and metric space properties, orthogonality in L^2. (5 class periods, sections 8.1–8.5)

6. Abstract measure spaces: generalization of the topics listed above, absolutely continuous and singular measures, the dual space of L^p.(6 class periods, sections 10.1–10.4)

7. Differentiation in R^n: indefinite integral, Lebesgue's differentiation theorem, Vitali covering lemma, the differentiation of monotone functions. (5 class periods, sections 7.1–7.4)

Course Policies

Grading. The grades will be based on homework (40%), quizzes (5%), one midterm exam (25%), and final exam (30%). The grading scheme will be no stricter than: 93 for A, 90 for A-, 87 for B+, 83 for B, 80 for B-, 77 for C+, 73 for C, 70 for C-, 60 for D.

Homework will be assigned and collected electronically on the website Overleaf.com. You are encouraged to discuss the homework problems with your classmates and to work together, but submitted assignments must be written up individually. Two lowest homework scores will be dropped.

Quizzes will be given at the beginning of class, and will be based on the material of previous class. Each quiz will consist of one True/False question. Two lowest quiz scores will be dropped.

Midterm Exam will be in class on **Friday October 12**. The time and place of the **Final Exam** will be announced in class. There will be no make-ups: a missed exam counts as zero unless you present a valid excuse from a physician or the Dean's office. If the absence is excused, your final exam grade will be used to replace the missed exam.

Tips for success in this course:

- It is absolutely essential that you understand how to solve all the assigned problems. Once you understand how to solve a problem, write your solution down neatly and in full detail with explanations that make your reasoning clear.

- Don't fall behind. If you are having difficulties keeping up with the material, see me immediately to discuss the problem.

- Ask questions: in class, after class, during office hours, or by email.

University Policies

Students with disabilities. If you believe that you need academic adjustments (accommodations) for a disability, please contact the Office of Disability Services (ODS), visit the ODS website– http://disabilityservices.syr.edu, located in Room 309 of 804 University Avenue, or call (315) 443-4498 or TDD: (315) 443-1371 for an appointment to discuss your needs and the process for requesting academic adjustments. ODS is responsible for coordinating disability-related academic adjustments and will issue students with documented Disabilities Accommodation Authorization Letters, as appropriate. Since academic adjustments may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Academic Integrity. Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. SU students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice.

The Violation and Sanction Classification Rubric establishes recommended guidelines for the determination of grade penalties by faculty and instructors, while also giving them discretion to select the grade penalty they believe most suitable, including course failure, regardless of violation level. Any established violation in this course may result in course failure regardless of violation level.

Religious observances policy. SU religious observances policy recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to are religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice (Student Services -> Enrollment -> My Religious Observances) from the first day of class until the end of the second week of class.