MATH 4138 Syllabus

Analysis 2, Section AU, 3 credit hours

Spring 2027

Instructor Information. Instructor: Dr. Asaf Katz

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General Course Information.

Description. This course has two complementary goals:

- a rigorous development of the fundamental ideas of analysis, and
- a further development of the student's ability to deal with abstract mathematics and mathematical proofs.

Topics would be covering the standard syllabus of differential and integral calculus in a single variable and also several variables.

(1) The derivative: mean value theorem, L'Hôpital's rule, Taylor's theorem

(2) The Riemann (Stieltjes) integral, integration by parts, change of variables. Sets of measure zero, Cantor functions, Improper integrals

(3) The derivative in $\mathbb{R}^n$: Jacobians, chain rule, implicit and inverse function theorems. Extrema, second derivative tests, Lagrange multipliers

(4) Integration in $\mathbb{R}^n$: Mean value theorem, iterated integrals, and change of variables. Sets of measure zero and Sard's theorem

The key words in this class are rigor and proof; almost all of the material of the course is geared toward understanding and constructing definitions, theorems (propositions, lemmas, etc.), and proofs. This is considered one of the more difficult among the undergraduate mathematics courses, and students should be prepared to make a strong commitment to the course.

Course Learning Outcomes. Upon successful completion of this course, you should be able to

- Define the basic concepts of differential and integral calculus.
- Know how to handle analytic arguments as a basis for more advanced classes in analysis, geometry and topology.
- Understand proof writing and developing complex arguments.

Required Course Materials. We will follow the book *Bartle, Elements of Real Analysis. We will complement the book by Spivak's Calculus.*

*Grading Policy. Your final course grade will be composed of two midterms (*25% *- each), final exam (*30%*) and written weekly homework sets (*20%*).*
Exams to be graded.

- *Midterm 1 - 25% , 2/17/2027.*
- *Midterm 2 - 25% , 3/15/2027.*
- *Final exam - 30% , per registrar's exams matrix.*

After all grades are in and all overall percentage scores for students have been computed using the weights described above, grades are assigned. The standard cutoffs are as follows.

A: [90%, 100%] B: [80%, 90%) C: [70%, 80%) D: [60%, 70%) F: [0%, 60%)

So, to guarantee an A, get 90% or better overall. (90 means 90, not 89.9)
To guarantee at least a B grade, get 80% or better overall, etc.
These cutoffs might be adjusted, but only in the downward direction (to make letter grades higher). In the event of a curve, only your final overall percentage grade for the course will be curved. Individual assessments will not be curved as we go along.

Description of Graded Components. The homework assignments, together with the midterms and final will be graded for both accuracy and completeness. The homework assignments will be challenging. This class is highly rigorous math class, aiming at preparing students for graduate-level mathematics courses.

Course Policies

Attendance and Participation. *Students are strongly encouraged to attend the lectures and participate in them. Exams will be given in person, midterms during lectures and final exam in the date and time determined by the registrar. Participation in these exams is mandatory, absences will be excused only with relevang medical documentation dated to the day of exam and verified through the dean of students.*

Academic Integrity. *Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.*

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities. *If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.*

Student-Faculty Expectations Agreement. *At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.*