Modality, Meetings, and Group Work:
This course will meet online on Zoom. There will be two choices of synchronous meeting time; Monday/Wednesday 12-1:30 pm Eastern or Monday/Wednesday 10-11:30 pm Eastern. You must pick one of these two sessions and attend it for the entire semester (you must choose the same time for both days). Attendance will be taken and many aspects of the course will center around small group work, so it is imperative that you are present in these meetings with your group. A survey will be administered on the first day to help create groups and get time preferences.

Calculus:

Learning Goals for Math 110:

1. Develop a mature, proof-based approach to mathematics
2. Put past knowledge from calculus and linear algebra on firm theoretical footing.
3. Hone your problem solving skills.
4. Develop and leverage a learning community for math. Learn to use the typesetting system LaTeX.

Prerequisite:
MATH 15a or 22a and MATH 20a or 22b, and MATH 23b, or permission of the instructor.

Text:
Main textbook:

Introductory Real Analysis, by A.N. Kolmogorov and S.V. Fomin.

Recommended but not required:

Counterxamples in Analysis, by Bernard R. Gelbaum and John M.H. Olmsted.

LATTE:
All course materials for Math 110a will be available online on LATTE. Log in at http://latte.brandeis.edu using your Unet username and password.
How will we achieve the Learning Goals?

- **Readings** *(Learning Goals #1, 3)*
  Every week we will read passages from the textbook (or supplemental material provided on LATTE). An important part of being a self-guided learner of mathematics is the ability to read and extract meaningful knowledge from a math textbook.

- **Supplemental Videos** *(Learning Goal #1)*
  There will be two types of videos: short, introductory videos explaining the learning objectives of each section and long-form lecture videos featuring more technical exploration of each topic.

- **Instructor Explication** *(Learning Goal #1)*
  I’ll answer questions that came up in the reading or in other assignments, or take some time to explain particularly difficult concepts or techniques during the synchronous class meetings.

- **Struggling Together** *(Learning Goals #1, 2, 3, & 4)*
  We’ll work on examples and problems in our teams. This is an opportunity to really struggle with the ideas and techniques – struggling with challenges is how we learn. Talking through ideas and strategies with your teammates allows you to check your understanding and spot any holes in your reasoning. And I’ll always be there to help when your team gets stuck!

- **Team Quizzes** *(Learning Goals #1, 2, 3, & 4)*
  We’ll have weekly quizzes that you’ll take alone first. After you’ve had a chance to engage with the material and select your answers, you’ll immediately turn around and take the exact same quiz with your team. Harness the power of your team to converge on the right answers and the correct reasoning.

- **Homework** *(Learning Goals #1, 2, & 3)*
  Practice makes perfect! We’ll have homework assignments for each section so you can practice your new skills and deepen your understanding.

- **Assessments** *(Learning Goals #1, 2, & 3)*
  There will be no exams in the course. In place of exams, weekly homework will be longer and more challenging. Additionally we will have end-of-term papers exploring more in-depth mathematics not covered in class.

- **Closing the Feedback Loop** *(Learning Goals #1, 3, & 4)*
  We’ll have time each week to reflect on the previous group work and quizzes. At the end of each week, you will write a short paragraph summarizing your understanding of what you learned and what questions you still have about the material.

- **Learning LaTeX** *(Learning Goal #5)*
  LaTeX is the typesetting system used by (almost all) professional mathematicians. There is a learning curve to using it, but it is relatively simple to use once you know the basics. There will be an assignment teaching you how to use LaTeX on the first day and your final paper must be written in TeX.
Syllabus:

We will cover approximately the first 9 chapters of Rudin, though not necessarily in the order or style of Rudin.

Note: Some topics may be added or omitted as time permits.

1. Basic set theory, number systems, groups, rings, and fields
2. Sequences, convergence, metric completion, construction of the real numbers
3. Metric spaces and topology
4. Differentiation and integration in one variable
5. Uniform convergence, contraction mapping
6. Linear algebra
7. Differentiation and integration in several variables
8. The Inverse and Implicit Function Theorems
Grading

Your grade in this course will be a combination of the following factors:

- **Participation (10%)**
  Online learning is challenging, and one of the major difficulties involves the lack of a sense of community in many online courses. We will use small group work and group quizzing to help us achieve this sense of community, but that means you need to be engaged and present in class. This portion of the grade will be a mix of: Attendance in class, periodic reflections on the course and on your learning.

- **Homework (50%)**
  There will be a weekly homework assignment consisting of textbook problems and supplemental problems. Many problems will be very challenging and constitute a very serious component of the class. There will be 12 assignments, of which the bottom 3 by percentage will be dropped at the end of the semester.

- **Quizzes (15%)**
  Each Wednesday we will have a short quiz which you will take individually, and then immediately retake again as a group. This allows you to discuss the questions with your friends and peers while it is still fresh in your mind. It is your job as a student not only to learn the material, but also to learn how to communicate your knowledge. You will be given the average of the individual and group score for the week. We will drop the lowest three by percentage at the end of the semester.

- **Final Project (25%)**
  There will be a final project which will involve you writing a short paper and recording a short video presenting some problems or applications from the class. Details about this assignment and its scaffolding will be coming soon and will be found on the course LATTE page.

Other Course Information

Calculators:

Calculators are **not** allowed during quizzes. You should have access to a scientific calculator for homework (you can use a free online one), but you do not need a graphing calculator.

Four-Credit Course (with three hours of class-time per week):

Success in this 4 credit hour course is based on the expectation that students will spend a **minimum of 9 hours of study time per week** in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

Accommodations:

Brandeis seeks to welcome and include all students. If you are a student who needs accommodations as outlined in an accommodations letter, please talk with me and present your letter of accommodation as soon as you can. I want to support you.

In order to provide test accommodations, I need the letter more than 48 hours in advance. I want to provide your accommodations, but cannot do so retroactively. If you have questions about documenting a disability or requesting accommodations, please contact Student Accessibility Support (SAS) at 781.736.3470 or access@brandeis.edu

Academic Integrity:

You are expected to follow the University’s policy on academic integrity, which is distributed annually as section 4 of the Rights and Responsibilities Handbook (see [http://www.brandeis.edu/studentaffairs/srsc/rr/index.html](http://www.brandeis.edu/studentaffairs/srsc/rr/index.html)). Instances of alleged dishonesty will be forwarded to the Department of Student Development and Conduct for possible referral to the Student Judicial
System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about how these policies apply to your conduct in this course, please ask.

**Necessary Equipment and Available Resources:**

Success in this online course will require a **webcam with a microphone** and internet access. If you need assistance with acquiring any of these items, contact emergencyfunds@brandeis.edu. *You will be required to have your camera ON and your mic OFF during class. All classes will be recorded.*

Many resources are available to help with the academic and non-academic factors that contribute to student success (finances, health, food supply, housing, mental health counseling, academic advising, physical and social activities, etc.). Please explore the links on the Support at Brandeis page [https://www.brandeis.edu/support/undergraduate-students/browse.html](https://www.brandeis.edu/support/undergraduate-students/browse.html) to find out more about the resources that the University provides to help you and your classmates achieve success.

**Timely communication:**

Use your Brandeis email to reach out to me. I am usually able to respond quickly to most messages, within 24 hours, although during the weekends and over holidays it could take me longer. If I reach out to you, with a query or comment or in response to an email from you, I would appreciate it if you would acknowledge receipt of my message and/or respond with 24 hours, unless it’s during weekend or over a holiday. Note that we will use your Brandeis email address, so you need to check it regularly.

All course announcements can be found in the [Course News & Announcements](#) page on Latte.

**Time zones:**

All times listed on this syllabus will be given in Eastern time, but on November 1 *Daylight Savings Time* will end in the US, which may change your local time at which class and assessments meet. *It is your responsibility to adjust accordingly.* I will remind everyone often as that time approaches.

**Name/Pronouns:**

If you have a preferred name and/or preferred pronouns you would like me to use, please let me know either by email or in person. Thanks!