Math 35A Advanced Calculus and Fourier Analysis
TTh 2:00-3:30pm Via Zoom

Instructor:	Ying Zhang
Email:	yingzhang@brandeis.edu
Lecture Zoom Link:	https://brandeis.zoom.us/j/93027954505
Ying's Office Hours:	M 9:30am-10:30am, W 2:00pm-3:00pm, or by appointment.
PhD Grader:	Gabriel Lozada Rodriguez (email: gabriell@brandeis.edu)
Gabriel's Office Hours:	T 3:00pm-4:00pm.
CA:	Niharika Sharda (email: nsharda@brandeis.edu)
Niharika's Office Hours:	W 9:00am-10:00am.
Textbook:	"Fourier series and boundary value problems", James Ward Brown and Ruel V. Churchill, **8ed**, ISBN is 978007803597-5. "Mathematical Methods in the Physical Sciences", Mary L. Boas, **3ed**, ISBN is 0-471-19826-9. (e-copies available through Brandeis library)

Course Description: Math 35A is a course designed for math, science, and economics majors, and students interested in engineering and applications of mathematics. We will introduce basic concepts of Fourier analysis and its generalizations, which are common and useful tools for solving problems arising in physics, biology, and other scientific fields.

The idea of Fourier analysis is to express general functions as sums of other choices of basis functions such as sines and cosines. One can interpret it as decomposing a vector into a set of basis vectors in the context of linear algebra. Toward the end of the semester, we will discuss differential equations and specifically focusing on approximating solutions using Fourier analysis.

Expectation of Students Effort: Success in this course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for the class (reviewing class material, completing homeworks, preparation for exams, etc.).

Course Outline (Subject to change):

- Introduction/review of basic mathematical concepts: series, convergence tests, error estimates, sequences of functions, complex numbers
- Fourier series decomposition of a function on a finite interval.
- Fourier integral of a function on an infinite interval
- Introduction/review of differential equations, and techniques of solving ordinary differential equations
- Method of separation variables and use it to construct general solutions to boundary value problems

Main Learning Goals:

- Perform error estimates and demonstrate convergence of series
- Represent a continuous function over a finite interval as a sum of sine and cosine functions
- Understand necessary conditions on a function to guarantee the existence of a valid Fourier decomposition
- Use method of separation of variable to construct general solutions to simple boundary value problems

Grading Policy:

- Worksheets - 15%,
- Homeworks - 25%,
- Midterm - 25%,
- Final - 25%,
- Self-assessment Report - 10%.

1). Worksheets: Worksheets will be issued weekly available on weekend on LATTE, and must be submitted by the end of the following Friday. Each worksheet contains an overview and a list of key concepts of the lectures in the following week, as well as a few questions that help you to identify the essential components of the lecture, the main theorem(s), and important methods. The worksheet is designed to help you recognize key ideas covered in lectures.

Worksheets will be graded based on completion. Full credit (10/10) if you have made a **strong** effort and finished almost the entire worksheet, half-credit (5/10) if you have skipped several parts or made a poor effort on finishing the worksheet, no credit (0/10) if you have done almost nothing or made a poor effort on finishing most of the worksheet.

2). Homeworks: Weekly homework assignments will be given on Thursday on LATTE, and must be submitted by the end of class the following Thursday via LATTE. **You are encouraged to work with your classmates. However, you should write your solutions by yourself and with your own words, and make sure to list their names**.

There will be about 5 problems *randomly selected* for grading for each homework assignment. Each problem is worth 10 points. Please finish your homework in a neat and complete way so that partial credits can be given. Your lowest homework score will be dropped.

3). Exam Policy: The midterm and the final will be given as take-home exams. You will have 24 hours to finish it. You may use textbook, lecture notes or Internet to assist you. **You may work with your classmates but please write your solutions by yourself and make sure to list their names as well as all the resources you use**.

If the exam date and time conflict with other university duties, document medical (or other) emergency, the instructor must be notified at least **one** week before the exam, and a makeup exam will be given separately.

4). Self-assessment Report: Detailed instructions on completing a short self-assessment report will be available on LATTE after 12/03. You will be asked to answer a few questions that aim to reflect on your learning in this course.

Late and Graded Homework Policy: Late homework will not be accepted unless there is a emergency/unexpected situation and an extension will be given. Homeworks will be returned via LATTE. It is your responsibility to make sure you receive back any homeworks you submitted, and to store them in case any grades are incorrectly recorded. If you do not receive back a homework you submitted, please talk with me *immediately*. I will not discuss missing or incorrectly graded assignments at the end of the semester.

Lecture Participation/Video Recording: You are encouraged to attend each lecture synchronously but it is not mandatory. If you are having difficulties with Internet, you may watch the recorded lectures that will be available on LATTE. I will also post lecture notes on LATTE no more than 24 hours after each lecture.

Remote Office Hours: Weekly office hours will be hold remotely via Zoom. You may ask any question related to the course material (homework, lecture notes, etc) or just come and mingle!

Accessibility Support: Please take with me and present your letter of accommodation at the beginning of the course if you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class. If you have questions about documenting a disability or requesting accommodations, please contact Student Accessibility Support (SAS) at access@brandeis.edu.

Academic Integrity: Your conduct in this course, as with all Brandeis' courses, is governed by Brandeis University Rights and Responsibilities student code. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. A copy of the code is available at https://www.brandeis.edu/studentlife/srcs/rightsresponsibilities/index.html.

COVID-19 Updates: Brandeis University will be closely monitoring COVID-19 situation. Any adaptation that shall be made can be found at https://www.brandeis.edu/coronavirus/.