

MATH 4581 Syllabus

Classical Mathematical Methods in Engineering, Section AG, AU, Q, 3 credit hours

Fall 2026

Instructor Information

Instructor: Dr. Andrzej Swiech

Email: swiech@math.gatech.edu

Office: Skiles 206

General Course Information

Description

The primary objective of the course is to introduce the students to certain analytic methods for solving partial differential equations. The main tools we will focus on are Fourier series, the method of separation of variables, and the Laplace transform. We plan to cover the following material:

- Vector spaces, norms, inner products, orthogonal projections, the space $L^2(a, b)$, Fourier series, Fourier integral.
- The Sturm-Liouville theorem.
- Heat equation: derivation and the method of separation of variables.
- Wave equation: D'Alembert's solution, separation of variables.
- Laplace and Poisson equations: separation of variables in polar and cylindrical coordinates, method of eigenfunction expansion.
- Laplace transform: basic properties, applications to ordinary differential equations.
- Further applications of the Laplace transform: heat flow problems in half spaces, motion of semi-infinite string.

Course Learning Outcomes

- Students should acquire basic theoretical knowledge about PDE.
- Students should be able to solve basic PDE by separation of variables, transform methods and other explicit techniques.

Required Course Materials

D. L. Powers, *Boundary Value Problems and Partial Differential Equations*, 6th edition, Elsevier Academic Press, 2010.

Grading Policy

There will be three tests, one homework assignment and the final exam. The dates of the tests will be announced at the beginning of the semester. Your grade will be based on how well you can solve problems and compute using the theory. You will not be asked to reproduce proofs. To get an A, respectively B, C, and D, your final score will have to be greater than 85%, respectively 70%, 55%, and 40%.

Assignments

- Test 1, 15% of the final grade
- Test 2, 15% of the final grade
- Test 3, 15% of the final grade

- Homework assignment, 20% of the final grade
- Final exam, 35% of the final grade

Description of Graded Components

The tests and the final exam will be designed to check how well you can solve problems and compute using the theory. You will not be asked to reproduce proofs. Computers, calculators and mobile devices will not be allowed during the tests and the final exam.

The homework assignment will be posted in advance and will be collected in November. The due date will be announced at the beginning of the semester. The homework assignment will contain several problems testing knowledge across all material. These problems may require more work than those given in tests. In addition, a list of suggested homework problems from the textbook will be posted on canvas. They will not be collected. These problems should help you determine what part of the material you have mastered and what you still need to work on. However, they will not constitute a complete set of exercises sufficient for getting an A in the course.

I encourage the students to learn together and exchange ideas, including ideas about homework problems. However all the work submitted by you for grading must be your own. The use of AI is not allowed for homework problems.

Course Policies

Attendance and Participation

The lectures will be in-person. Attendance is not mandatory, however I encourage everybody to attend lectures as sometimes I may be presenting material which is not available in the textbook. Lectures will be recorded and will be available on Canvas.

Make up Tests and Late Homework

There will be no extra credit opportunities. Late homework will not be accepted. Make-up exams can be given if the exam was missed because of institute approved activities, illness, etc. (see <http://www.catalog.gatech.edu/rules/4>). Please contact me in advance in such cases.

Inclement Weather and Digital Learning Days

In case of inclement weather we may switch to online classes. The zoom link will be provided on the Canvas course web site.

Distance Learning Students (Q Section)

The details regarding the method to administer the tests and the final exam as well as the allowed delay for the exams and the homework assignment will be announced later.

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.