

MATH 4581
CLASSICAL MATHEMATICAL METHODS IN ENGINEERING
COURSE SYLLABUS
FALL 2017

INSTRUCTOR: ANDRZEJ SWIECH

LECTURES: MWF 12:20-1:10 PM, SEB

OFFICE: SKILES 206

OFFICE HOURS: M 10:00-11:00, T 2:00-3:00 PM, F 1:30-2:30 PM

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COURSE WEB PAGE: <http://www.math.gatech.edu/~swiech/4581f17.html>

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

MATERIAL TO BE COVERED AND COURSE OBJECTIVES: The primary objective of the course is to introduce the student 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:

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

HOMEWORK: Suggested homework problems are posted on the course web page (<http://people.math.gatech.edu/~swiech/4581-hw-book.html>). Other problems will be posted there too. 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. A separate homework assignment will be given which will be collected.

GRADING: There will be three tests (September 20, October 23, and November 17), one homework assignment (due on November 20), and the final exam (December 13, 11:30 am -2:20 pm). Each test will count for 15% of the final

grade, the homework assignment for 20%, and the final exam for 35%. 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%.

ONLINE STUDENTS: Students taking the course online will need a physical proctor for the tests and the final exam. The students will be allowed 3-day delay for the exams and the homework. The graded exams and the homework will be returned to them via T-Square. The best way to communicate with me is by e-mail.

Please be aware of the Georgia Tech Honor Code and follow it carefully. In particular please make sure that all the work you submit is your own. The Georgia Tech Honor Code can be found at <http://www.policylibrary.gatech.edu/student-affairs/code-conduct>.