Soochow University

MATH 4120 Partial Differential Equations

Course Outline

Summer, 2020

The course provides students with an introduction to the methods and applications of the partial differential equations (PDE). The course discusses a great variety of topics, including the wave equation, the heat equation, wave and diffusion, Fourier series, the Laplace equation and harmonic functions.

Course Information

Contact Hours: 54 hours

Credits: 3 credits

Course Prerequisite: MATH 2010 Calculus II

Instructor: TBA

Course Objectives

Upon successfully completing the course, students will be able to:

1. Demonstrate an understanding of the meaning of a partial differential equation (PDE), the order and solution of PDE and boundary conditions
2. Derive the heat, wave and Laplace equations utilizing physical laws
3. Define the Fourier series and apply them to the partial differential equations

Textbooks/Materials

Walter A. Strauss. (2008). *Introduction to Partial Deferential Equations*, 2nd edition, John Wiley & Sons.

Walter A. Strauss. (2008). *Partial Differential Equations: Student Solutions Manual: An Introduction*. 2nd edition, John Wiley & Sons.

Attendance Requirements and Academic Integrity

Students are required to attend classes on the scheduled time. Missing classes without permission will lead to decrease in overall grade.

- Missing less than two classes: no penalty.
- Missing more than two classes: 7% will be taken off from the overall grade.

Exams must be taken on the scheduled day and location. There will be no makeup exam for summer sessions.

A nonprogrammer calculator could be used in the tests.

Soochow University values academic integrity, respect, fairness, honesty and responsibility. Students must be aware of and comply with Soochow University's Academic Integrity policies. Any cheating, falsification, plagiarism, impersonation or any attempting to commit the above will be reported to the university's administration office. Any academic dishonesty behaviors will be kept on record and students will be punished according to the rules.

Evaluation and Grading

Participation and Homework	10%
3 Assignments	5% for each
2 Midterm Tests	20% for each
Final Exam	35%
	Total: 100%

Homework will be given on a regular basic in order to reinforce the understanding of specific skills and they should be submitted to the course website. Assignments are required to finish independently and submitted on time.

Midterm Tests will be held on the middle of the class while the Final Exam will be on the last day of the class. More details will be informed in class.

Soochow University's grading scale is shown as the following:

Letter Grade	Score Grade	Grade Point Average
A+	95-100	4.0
A	90-94	4.0
A-	85-89	3.7
B+	80-84	3.3
B	75-79	3.0
B-	72-74	2.7
C+	68-71	2.3
C	65-67	2.0

C-	60-64	1.7
D+	55-59	1.3
D	50-54	1.0
F	< 50	0.0

Course Topics

1. Week of July 20th: **Assignment 1 due (5%) Midterm Test 1 (20%)**

Course Introduction and Overview

Introduction of the basic vocabulary

The First order linear equations. Introduction of the method of characteristics, and the method of change of coordinates.

The importance of initial and boundary conditions when studying PDE

Generalities about second-order equations

Midterm Exam 1

2. Week of July 27th:

The wave equation - Part I

The wave equation - Part II

The heat equation - Part I

The heat equation - Part II

Comparison between the regimes of waves and diffusion.

3. Week of August 3rd: **Assignment 2 due (5%)**

Resolution of the heat equation by the method of separation of variables

Resolution of the heat equation by the method of separation of variables, in the case of Neumann and Robin boundary conditions.

Presentation of the three types of Fourier series

How to choose between the three kinds of Fourier series? Even and odd functions.

Complex Fourier series

4. Week of August 10th: **Midterm Test 2 (20%)**

Midterm Exam #2

Convergence of Fourier series in three different mathematical settings

Differentiation and integration of Fourier series

Dealing with inhomogeneous boundary conditions in PDE, using Fourier series.

Properties of the Laplace equation

5. Week of August 17th: **Assignment 3 due (5%) Final Exam (35%)**

Laplace equation in a disk.

Harmonic functions

Final Exam Review