MATH 3150-004, Partial Differential Equations for Engineers , Spring 2020

Class Meetings: MW 06:00PM-07:20PM, WEB 1450

Instructor: Dr. Dong Wang (dwang@math.utah.edu)

Office Hours: MW 9:30 – 10:30 AM in LCB 202, or by appointment


Course Objectives: The subject of partial differential equations (PDE) has been the most relevant to many scientists and engineers working with mathematical models, and it continues to be one of the most active mathematics research fields, as old problems are being solved, or remain to be solved, and more challenging and exciting equations keep emerging. In this course, we will discuss the subject starting from the modeling of physical problems and the derivations of the equations, and introducing the approaches that lead to Fourier series or Fourier transform representations of the solutions, and use the classic ideas as stepping stones to explore practical solutions for problems encountered in the real world. Specifically, we will learn about the following:

- Become knowledgable about PDEs arising from classic physical problems and their classifications, be able to derive heat and wave equations based on the idea of flux balancing;
- Distinguish the roles played by time and spatial variables, and initial vs. boundary conditions for the PDE problem;
- Appreciate the importance of boundary conditions, and use separation of variables technique for PDEs in finite rectangular regions to reduce the problem to several ODE problems;
- Understand the ideas of equilibrium and steady solutions, and make a connection between the heat equation and the Laplace’s equation;
- Learn about representing functions by Fourier series, as candidates for PDE solutions, and furthermore understand the principle behind the formulas for the coefficients;
- Understand the concept of series convergence and its relevance to PDE solutions;
- Solve the one-dimensional initial/boundary value problems for the wave equation and heat equation in bounded regions;
- Understand the idea of Fourier transform in conversion of a PDE problem involving unbounded regions;
- Be familiar with the technique of Fourier transform and use it to solve PDEs in unbounded regions.

Canvas: Canvas will be used for posting course announcements, homework assignments, grades, files and any relevant supplementary material. You are also welcome to make use if the Canvas discussion board to discuss course problems or topics. You can access the Canvas page through CIS or by logging in at utah.instructure.com. Students should check the Canvas page regularly for course information and resources. Email notifications and correspondence will be sent to the student’s UMail address ([u-number]@utah.edu); this email account must be checked regularly.

Grading: The course grade will be based on weekly homework (20%), bi-weekly quizzes (20%), one midterm exam (25%), and a final comprehensive exam (35%). The grading scales are as the follows.

Final exam: The final exam will be in our regular classroom on Monday, April 27, 2020, 6:00 pm – 8:00 pm. It will be closed books and notes, no calculators or other electronic devices.
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- **Homework:** Weekly assignments will be posted on Canvas each Monday, and collected on the following Monday. No late homework will be accepted.

- **Bi-Weekly Quizzes:** On each bi-Wednesday except the midterm weeks, there will be a 15-minute quiz. The problems are more conceptual for the emphasis on ideas rather than final answers. Those quizzes are closed book and closed notes.

- **Midterms:** There will be one 80-minute midterm exams on **Wednesday, March 18, 2020.**

**Tutoring Center:** Free tutoring is available in Room 155 of the T. Benny Rushing Mathematics Center, located between JWB and LCB. It opens M-Th 8:00 am - 8:00 pm, Fri 8:00 am - 6:00 pm.

**ADA Statement:** The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations for the course.

**Safety Statement:** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.