

MTH 441 Partial Differential Equations Fall 2019

Instructor: Orlando Merino, merino@uri.edu, 200F Lippitt Hall, 8744442
Textbook: Partial Differential Equations for Scientists and Engineers, by Stanley Farlow.
Calculator: Not required, and not allowed in tests.
Meets: MoWeFr, 11 a.m.-11:50 a.m., 214 Quinn Hall.
Office Hrs: To be announced, or by appointment.
Prerequisite: MTH243, MTH 244 or MTH 362.

About the course MTH 441 is the introductory course for partial differential equations. The object is to present an elementary treatment of the most important topics of the theory together with applications to problems from the physical sciences and engineering and other areas.

PDEs are of fundamental importance in many areas; here is a sample of applications:

- Engineering: heat/diffusion equation for heat/mass transfer, wave equation for motion of strings, membranes.
- Physics: Laplace/Poisson equation for electrostatic potential, Schroedinger equation (quantum bound states of the hydrogen atom).
- Biology: reaction diffusion equations, models of swarming (integro-differential equations).
- Economics: Black-Scholes PDE for stock options, fair strategies for bonds.

This course is designed for undergraduate students and some graduate students majoring in mathematics and engineering. Also, the course provides a good basis for those students who will pursue the study of more advanced topics. The solution techniques studied in this course rely on turning PDEs into ODEs, so this course builds on students' understanding of and facility with ODEs.

Time permitting, in this course we will cover most of Chapters 1 through 4 of the textbook, plus some of Chapter 5.

Outcomes and objective: At the end of the course, we expect that students will be able to:

- Identify the correct differential operator in a given linear PDE and solve the associated eigenvalue problem.
- Identify the underlying PDE for a given physical phenomenon or application.
- Identify the appropriate solution strategy for a particular PDE problem and correctly carry it out.

The objective is that the students can use their understanding of the behavior of basic, canonical PDEs to build an intuition for how more complicated PDEs will behave, and also see PDEs as useful tools for describing and modeling a vast range of phenomena.

Assignments: We will have homework collected every day of class, with some exceptions. Also **computer homework** may be assigned. Homework questions will be answered at the beginning of class. You may also email me your questions (merino@uri.edu).

Submitted work: It is your responsibility to communicate clearly in writing up solutions for homework and exams. Your results must display your understanding well and be written in a correct, complete, coherent, and well-organized fashion.

Evaluation: Your grade will be based on a midterm exam, final exam, and homework (announced in class):

Midterm Exam (25%); Final Exam (25%); Assignments (50%).

Expectations: You are expected to attend every lecture (but no attendance is taken), and to submit your work on time -- no late work will be accepted (exceptions allowed for medical reasons). You must check SAKAI frequently.

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In class Please ask questions at any time. I will make an effort to clarify difficult concepts, or to explore any interesting ideas you may want to share. Class participation has a positive impact on the student's learning, and I encourage it.

Outside of class To keep up with the rapid pace of the class requires that you plenty of time doing homework, reviewing notes, reading the book, and working out extra problems, all in addition to the time spent in class.

Accommodations: Any student with a documented need for accommodations is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations (contact Disability Services for Students Office at 330 Memorial Union 401-874-2098).

Academic Honesty See University Manual section 8.27.10-8.27.20

Civility If you must come in late or leave early, let me know and please do not disrupt the class. Please turn off all cell phones, ipads, etc. Please refrain from texting during class.

Make-Up Policies: Make-up exams will only be given for documented, extenuating circumstances at the instructor's discretion. The instructor must be notified before the day of the assessment if you will be participating in a University-sanctioned event or if you have some other reasonable conflict. If you are sick or are experiencing some other emergency, you must notify the instructor by email within two hours of the end of the class period for which any assessment is scheduled. Make-up assessments must be scheduled before the class meeting directly following the quiz unless specific arrangements have otherwise been made. Documentation must be provided to prove that any excuse is legitimate.

Incomplete Grade Please see the University Manual: 8.53.20 and 8.53.21