

GES 554 Partial Differential Equations

Spring 2017

Time: M/W/F 1:00 - 1:50 pm

Location: 251 Hardaway

Objectives: Theory, Classification, Formulation, Relevancy, Analysis, and Solutions of PDEs. We will investigate both analytical solution methods and computational methods.

Professor: Dr. Charles O'Neill, AEM, 222 Hardaway
Email: croneill@eng.ua.edu Phone: (205) 348-5161
Please put "GES 554: <subject>" in the email subject line for priority.

Office Hours: Open door policy or by appointment.

Class Website: <http://charles-oneill.com/ges554/>

Textbook: Partial Differential Equations for Scientists and Engineers, S. Farlow (**required**)
Partial Differential Equations in Action, Sandro Salsa, (optional, FREE library e-book)

Prerequisites: Differential Equations (MATH 238) or demonstrated capability
Computer programming recommended (Matlab ideal)

Goals:

By the end of the class, each student should be able to:

- Formulate PDEs commonly seen in engineering.
- Classify and provide analysis of PDEs.
- Demonstrate technical competency of PDEs

Topics:

We will cover all lessons and problems in Farlow's book. Selected topics and sources supplement Farlow's text.

- Classification and canonical forms
- Parabolic and diffusion equations, Laplace and Fourier methods
- Elliptic, BVP equations, Green's functions
- Hyperbolic, wave, and non-linear conservation equations
- Numerical and approximate methods
- Error analysis and verification & validation
- Monte Carlo, perturbation and conformal mapping methods

Grading:

Your grade depends on 2 components: Exams and Projects. Four exams are equally spaced: 3 hourly and 1 double-weighted final exam. Exam materials come from book questions and in-class discussions. Your ability to formulate and solve in-depth problems is evaluated with Projects.

Your final score is the sum of the top 3 exam and 3 project scores. One exam and one project will be dropped.

$$\text{Score} = \text{Exams} + \text{Projects}$$

Your letter grade is assigned based on the distribution of scores. The guaranteed cutoffs are: A \geq 90, B \geq 80, C \geq 70, D \geq 60, F $<$ 60. As this is a graduate course, intermediate grades (+ and -) are not applicable. The time derivative of your scores will be evaluated to improve (but never decrease) your grade.

Exam and Assignment Schedule:

- Three equally weighted (100 pts each) exams (c. 4th week, 8th week, 12th week) and one 2-hour (100 pts) final.
- Four projects (c. 3rd week, 6th week, 10th week, 14th week) of 100 pts each.

Attendance Policy:

Students are strongly encouraged to participate in class. Formal attendance records are never kept.

Missed/Late Coursework Policy:

Late work is graded at a step discount of 10% per week. Inform me ASAP if your job (e.g. military, industry, off-campus research, etc.) has unpredictable schedules or out-of-contact duties. I **will** work with you.

Distance Education:

This course is video recorded for distance students. Distance students should setup a proctor immediately at: http://bamabydistance.ua.edu/student-services/proctored_testing.html Distance students interested in forming an online study group can contact me for further information. I **strongly** encourage forming a class study group with distance (and potentially local) students.

Academic Misconduct:

All students in attendance at The University of Alabama are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University of Alabama expects from its students a higher standard of conduct than the minimum required to avoid discipline. At the beginning of each semester and on examinations and projects, the professor, department, or division may require that each student sign the following Academic Honor Pledge:

“I promise or affirm that I will not at any time be involved with cheating, plagiarism, fabrication, or misrepresentation while enrolled as a student at The University of Alabama. I have read the Academic Honor Code, which explains disciplinary procedure resulting from the aforementioned. I understand that violation of this code will result in penalties as severe as indefinite suspension from the University.”

Disability Statement:

If you are registered with the Office of Disability Services, please make an appointment with me as soon as possible to discuss any course accommodations that may be necessary or prudent.

If you have a disability, but have not contacted the Office of Disability Services, please call (205) 348-4285 (Voice) or (205) 348-3081 (TTY) or visit 133-B Martha Parham Hall East to register for services. Students who may need course adaptations because of a disability are welcome to make an appointment to see me during office hours. Students with disabilities must be registered with the Office of Disability Services, 133-B Martha Parham Hall East, before receiving academic adjustments.