Partial Differential Equations

MATH 555a, Fall 2016
MWF 10-10:50am, KAP 134

Instructor: Juhi Jang
Office: KAP 416E
e-mail: juhijang@usc.edu

Office hours: 2-3pm on Wednesdays and 11-12pm on Fridays or by appointment

Text: *Partial Differential Equations by Evans* and class notes

Course Description: In this course, we will discuss classical methods used in the study of partial differential equations (PDEs). During the first two thirds of the course we focus on concrete examples of PDEs of different types: conservation laws, the transport equation, the heat equation, the porous media equation, the Laplace equation, and the wave equation. We will address various tools such as energy estimates, characteristics, similarity solutions, and fundamental solutions to study PDEs. During the last third of the course, we will learn the theory of Sobolev spaces, which is a fundamental tool in modern analysis of PDEs.

Homework: Homework will be assigned almost every other week. You are strongly encouraged to work on your homework on your own. If you use other sources, you are required to state them in the homework.

Exam: One in-class midterm (Wednesday, October 12) and one take-home final.

Grade: Homework (50%), Midterm (20%), Final (30%)

Course information, assignments, and grades will be posted on Blackboard.

Tentative list of topics to be covered

Introduction and Overview
Examples of PDEs

Transport equation and Burger's equation
Linear trasport equation; Burgers equation; Weak solution

Laplace's equation and Poisson's equation
Fundamental solution; Poisson kernel; Green's function; Mean-Value property for Harmonic functions

Heat equation and Similarity solutions

Fundamental solutions; Heat kernel; Maximum principle; Scaling; Fourier transform and its applications

Wave equations

Spherical means; Finite speed of propagation

Sobolev spaces

Approximation by smooth functions; Extensions and traces; Sobolev inequalities; Compactness; Difference quotients; Fourier transform methods

Statement on Academic Conduct and Support Systems

Statement on academic integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Statement for students with disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.-5:00 p.m., Monday through Friday. Website for DSP (http://dsp.usc.edu) and contact information: (213) 740-0776 (Phone).

Emergency preparation/course continuity in a crisis

If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.