MATH 647 - APPLIED PARTIAL DIFFERENTIAL EQUATIONS
FALL 2017

- **Instructor:** Professor Milena Stanislavova
- **Office:** Snow 525, Phone: 864-4369 or 864-4365
- **Office Hours** MW 11:00-noon or by appointment.
- **Web:** stanis@ku.edu
  http://www.math.ku.edu/~stanis
- **Prerequisite:** Math 220/320 or equivalent.
- **Description:** This is a first course in partial differential equations for students in mathematics, physics and engineering with emphasis on applications. The purpose of this class is to introduce students to the origins, theory, and applications of partial differential equations (PDE). Several basic physical phenomena are considered, including vibrations and diffusion, and are used to derive the relevant mathematical equations. The fundamentals of the mathematical theory of PDE are motivated and developed for the students through the systematic exploration of these classical systems and their corresponding equations: the transport, wave, heat, and Laplace equations.

In addition to treating the physical origins of various PDE, this course focuses on solving evolution equations as initial value problems posed on unbounded domains (the Cauchy problem), and also on solving PDE on bounded domains (boundary value problems). While many explicit solution methods for such problems exist (we will survey many of them throughout the course), such methods often either produce solutions from which little usable information can be extracted or the solution method requires very special geometric requirements on the spatial domains (or both!). As such, it is often just as important and useful in the analysis of PDE to understand the qualitative properties of solutions in the absence of explicit solutions.

In addition to finding explicit solution techniques, we will also attempt to analyze the general behavior of solutions of a PDE without actually solving them. Such qualitative analysis is of fundamental importance in practice where explicit solution formulas for a given PDE either describe only trivial states or else don’t exist. In particular, we will learn about the underlying structure of various PDE and ways that one can exploit this structure to provide useful and practical information.

  – ISBN 048680737-1
• **Topics**: We will cover Chapters 1, 2, 3, 4, 6 and 7 of the book.

• **Other useful texts**: Partial differential equations - an introduction, by W. Strauss and Introduction to partial differential equations, by P. Olver

• **Homework**: Homework (both the reading and the exercises) should be completed by the next class after it is assigned. Homework will be collected on Fridays and each homework will be worth 20 points. Homework is a major part of the learning process in mathematics and it is essential that you work on the problems regularly. It is your responsibility to check the course website for homework and handouts regularly and to seek help on all problems that you cannot do. Help is available during office hours or by appointment with me. You must legibly write your name and class (Math 647) at the top right portion of any graded homework you turn in. Graded homework must also be stapled and folded in half (lengthwise) to be accepted. No late homework will be accepted.

• **Exams**: There will be one midterm exam and a final exam. The final exam is scheduled for Wednesday, December 13 from 7:30-10am and the midterm is tentatively scheduled for Friday, October 13.

• **Grade**: The grade will be determined as follows: Homework assignments - 20 %, Midterm exam - 40 %, Final exam - 40 %. As usual, 90 points will guarantee an A grade, 80 % will guarantee a B etc.

• **Students with disabilities**: The staff of Services for Students with Disabilities (SSD), 135 Strong, 785-864-2620, coordinates accommodations and services for KU sources. If you have a disability for which you may request accommodation in KU classes and have not contacted them, please do so as soon as possible. Please also see your instructor privately in regard to this course.

• **Religious observances**: Any student in this course who plans to observe a religious holiday which conflicts in any way with the course schedule or requirements should contact me as soon as possible to discuss alternative accommodations.