MATH 4491-001 - Partial Differential Equations (PDEs) - Spring 2022

MWF 9:55-11:10AM
F-115

Instructor:

Dr. Suzanne Nezzar
Office: C-104
Phone: (609) 626-3522
Email: *nezzars@stockton.edu*

Office Hours:

Monday & Wednesday	1-2PM
Tuesday	10:45-11:45AM

Textbook: *Partial Differential Equations, with Fourier Series and Boundary Value Problems,* 2^{nd} edition, by *Asmar*

Course Content: Partial Differential Equations pop up in many areas of study including Physics, Computer Science and Engineering. In this course we will look at some of these equations. We will also discuss solutions to both linear and nonlinear PDEs. Most of the material I plan to cover is in your textbook, however, not all. I am currently planning on covering the following topics:

1. *What is a PDE?* We will start out by discussing basic notation of PDEs. This includes the order of an equation, partial derivative notation, linear vs. nonlinear, etc.

2. *Second Order Linear Equations.* We will derive the basic wave (hyperbolic), heat (parabolic) and Laplace (elliptic) equations. We can solve these three equations on rectangular domains using Fourier (trigonometric) series. We will also discuss how to solve these equations on polar domains. Finally, we will use Fourier Transforms (related to Laplace transforms) to solve these equations on infinite domains. We will look at how linearity helps to analyze these equations and we will contrast the basic properties and behavior of each of these three equations.

3. *Image Processing Equations.* Image Processing is actually my main area of research. PDEs can be used to transform images in different ways. We will look at some linear and nonlinear equations which can blur, sharpen or locate boundaries in images.

4. *First Order Linear and Nonlinear Equations.* We will begin by analyzing the most simple first order linear wave PDE and then generalize our analysis. We will examine the behavior of nonlinear wave equations, where we will see that the solution becomes discontinuous as time progresses. Lastly, if time permits, we will generalize our analysis to any first order PDE.

Examinations: There will be two midterms and a final examination. The dates of the examinations are as follows:

Exam #1:	Monday, February 21
Exam #2:	Friday, April 8
Final:	Wednesday, May 4, 10AM - 12PM

I reserve the right to change any of the exam dates.

Project: One element of this course will be a group project. It will be based on the Image Processing techniques discussed in class. Each group is responsible for turning in one completed project and no matter how you decide to split up the work, you are all responsible for the submitted work. At the end of the group project, I will ask you to assess your fellow group members and explain each of your individual contributions to the project.

Maple: Maple will be the primary software used in this course for your project, as it is readily available on campus. Some of you may have experience using Maple, whereas other may not, so I will discuss some of the features of Maple that you may find useful. You are welcome to come to me with any questions you may have as well as discuss the use of Maple with your classmates.

Homework: You will be assigned homework problems approximately once a week and you will have one week to complete them. Working on the assigned problems will be essential to your success in this course.

Grade Determination:

Homework:	15%
Project:	15%
Exam #1:	20%
Exam #2:	20%
Final:	30%

Blackboard: I will use blackboard to post homework, projects, exam reviews (with their solutions), as well as exam solutions.

Attendance: Attendance is important in any class, but it is essential in math classes. For this reason I expect all of you to attend each class. You are responsible for everything covered in class, including lecture notes and announcements.

Make-Up Examinations: No make-up exams will be given without proper documentation.

Important Dates:

January 24:	Last day to drop with a 100% refund
February 1:	Last day to file for Spring 2022 graduation (without penalty)
February 9:	Last day to drop with a 50% refund (part time students only)
March 13-20:	Spring Break
March 29:	Preceptoral advising, no classes
April 6:	Preceptoral advising, no classes
April 7:	Last day to withdraw with a "W" grade
April 7:	Last day to file for Spring 2022 graduation

Grading Scale:

$90-100\%$	A
$87-89\%$	A-
$84-86\%$	B+
$80-83\%$	B
$75-79\%$	B-
$70-74\%$	C+
$64-69\%$	C
$60-63\%$	C-
$55-59\%$	D
$0-54\%$	F

Important Resources:

The Stockton Student Senate has requested that all faculty include the following important information on our syllabi. If you find yourself a victim of sexual misconduct, including sexual assault, domestic violence, dating violence, and/or stalking, the following resources are available to you at Stockton and in Atlantic County.

Confidential Resources:

WGSC Hotline:	609-849-8473
Counseling Center:	609-652-4722
Avanzar:	1-800-286-4184,www.avanzarnow.org

Non-Confidential Resources:

Stockton Police:	609-652-4390
Student Rights and Responsibilities:	609-626-3585
Title IX Coordinator, Valerie Hayes:	609-652-4693