Lamar University

Department of Mathematics

MATH 4302-16/5325-16, Partial Differential Equations
Spring 2020, Syllabus, January 21- May 12
TR 3:50-5:10, Lucas L209, 3 credits

Instructor: Dr. Mohsen Maesumi

Contact: maesumi@lamar.edu, Lucas L206, 409-880-8766

Office Hours: Online + Before/After each class + Walk-in + By Appointment
MWF 10:15-11:15, TR 2:50-3:50, knock on door L206

Prerequisites: Grade of C or better in Calculus III and Ordinary Differential Equations.

Website: http://www.math.lamar.edu/faculty/maesumi/syllabi.html

Recommended texts:
Advanced Engineering Mathematics, Zill,
Elementary Applied Partial Differential Equations, Haberman
Elementary Differential Equations and Boundary Value Problems, Boyce & DiPrima
Partial Differential Equations for Scientists and Engineers, Farlow
Elementary Partial Differential Equations, Berg & McGregor

Short To-Do list:
*Review differentiation and integration formulas
*Make a one-page resume for this class
*Correct "Preferred Banner email address" if instructed; and notify me.
*Submit class evaluation at the end of semester
*Exams: Thursdays February 13, March 12, April 23,
Cumulative Final Thursday May 7, 5-7:30.

Catalog Description: Boundary value problems with simple geometries in 1, 2, or 3 space dimensions for the heat equation, wave equation, and potential (Laplace) equation, separation of variables, Fourier series, Sturm-Liouville eigenvalue problems and Helmholtz equation, Rayleigh quotient, introduction to finite difference methods.
Prerequisites: Grade of C or better in MATH 3435 and MATH 3301 or their equivalents.
Offered: Once per 3 semesters.
Prepares for: Numerical Analysis 4315.

Learning Outcomes: Upon successful completion of this course, students will be able to:

1. Describe applications to sciences and engineering.
2. Understand the physical origins and modeling aspects of Partial Differential Equations.
3. Apply Fourier series methods for the heat equation with different boundary conditions.
4. Solve homogeneous wave equation with various boundary conditions.
5. Understand the divergence theorem in two or three space dimensions.
6. Solve heat diffusion problems in 2 or 3 dimensions.
7. Perform separation of variables in polar coordinates.
8. Obtain numerical solution of diffusion equations using MatLab, if time permits.

Topic (based on Zill's text):	**Section:**
1. Initial Value Problems (IVP)	1.2
2. ODEs as models	1.3
3. First Order ODEs	2.1
4. Direction fields	2.1.1
5. Autonomous ODEs	2.1.2
6. Separable ODEs	2.2.1
7. Integrating factor method	2.2.2
8. Euler Numerical Method	2.6
9. Introduction to MATLAB*	varies
10. Systems of ODEs	2.9
11. Second order ODEs for spring systems	3.8
12. Free undamped motion	3.8.1
13. Free damped motion	3.8.2
14. Driven motion	3.8.3
15. Boundary value problems (BVP)	3.9
16. Runge-Kutta numerical methods	6.3
17. Orthogonal Functions	12.1
18. Fourier series	12.2
19. Cosine and sine series	12.2
20. Separable partial differential equations	13.1
21. Classical PDEs	13.2
22. Wave Equations, derivation from F=ma	13.4
23. Heat equation	13.3
24. Laplace's equations	13.5
25. Numerical Solution of Laplace equation*	16.1
26. Numerical Solution of heat equation*	16.2

*If time permits

Lectures/Discussions: We will have traditional lectures augmented with substantial presentations by students. Many online resources will be used; as found in Course website.

Grading Plan:
Graduate: 20% homework, 20% presentation+notebook, 4*10% tests, 20% project
Undergraduates: 20% homework, 20% presentation+notebook, 4*12.5% tests, 10% project

Reading is required! Students should expect that they will be required to search and read related texts.

Homework Policies:
*Students are to show complete and well-written statement of each problem and its solution in their binder. Student have access to their notebook on exams and the completeness of your notebook is a major component of presentation grade. Late homework decreases points earned.

Exam Policies: (This information is subject to change)
*There will be three tests and a final each counting equally toward the total grade for the course.
*Approximate exams dates: Thursdays February 13, March 12, April 23, final May 7, 5-7:30.
*Grading scale: A>90>B>80>C>70>D>60>F.
*Exams are open notebook. You can have a handwritten lecture notebook including the solution of all homework problems. You are advised to have applicable tables of formulas, index, and page numbers.
*Students may have a basic scientific calculator on tests, (these typically cost less than $15).
*In case you want your exam to be reviewed and re-graded you need to notify me within one week from the day grades are given. Two weeks after the final exam your course grade data will be discarded, unless you make a written request, in person, during the semester.
*All issues that may influence your grade should be documented in an email from you to me and acknowledged in an email from me to you. At the time of the final test, and before final grades are given, send a summary email.
*If an emergency prevents holding the final exam for the whole class, a substitute grade will be made from existing grades at the instructor's discretion.

Term Paper/Project:
Students are required to write a term paper. The topic is listed on the course website.
The paper is to be typed, preferably in TeX (strongly recommended for graduate students and those planning to go to graduate school.)

Students are expected to work diligently toward the completion of their papers. Students are expected to come to office once every three weeks to show their progress. The chosen topic is from prerequisite of this course to allow students to start right away. You are STRONGLY encouraged to start early and stay on task. Terms paper should not be copied from the Internet or outsourced or postponed.

Student Resume: Students are required to make a resume for themselves applicable to this course. Items to include: a photo, detail of last four math courses taken, major, and minor. Optional information may include employment, long-term career plan, responsibilities, and any specific issue I need to know about. Give me a hard copy and email it as well. If the grade for this course is especially important to you detail for me the steps you are taking from the beginning of the semester to ensure your success.

Letters of Recommendations: Students who are applying to graduate schools or scholarships are encouraged to pay close attention to their project.

Corrections: While I have made a sincere effort to ensure that this syllabus is correct, changes may be required. I will announce any substantive changes during a regularly scheduled class or by email. If you have suggestions or concerns, feel free to bring it to my attention.