

# Lamar University

## Department of Mathematics

MATH 5325-01 Partial Differential Equations  
Fall 2017 Syllabus, August 28 - December 12  
MW 9:35-10:55, MAES 215, 3 credits

- Instructor:** Dr. Mohsen Maesumi
- Contact:** [maesumi@gmail.com](mailto:maesumi@gmail.com), maesumi@lamar.edu, Lucas L206, 409-880-8766
- Office Hours:** Online + TR 10:00-10:45, 2:15-3:00, MW 3:15-4:15, knock on door  
Other times available by appointment.
- Text:** Advanced Engineering Mathematics, Zill, 6<sup>th</sup> edition  
Other Recommended texts:  
Elementary Applied Partial Differential Equations, Haberman  
Partial Differential Equations for Scientists and Engineers, Farlow
- Prerequisites:** Grade of C or better in Calculus III and Ordinary Differential Equations.  
**Preferred:** Calculus I,II,III, Physics I,II, Linear Algebra, Differential Equations, Programming  
**Website:** <http://www.math.lamar.edu/faculty/maesumi/syllabi.html>
- Short To-Do list:** Read, print, and sign [Class Regulation Sheet](#) (sign roll).  
Correct your Banner email if you receive a note from me.  
Give a hard copy + email resume (sign roll).  
Sign on WebAssign (sign roll)  
Have a binder with 100+ sheets and four blue notebooks.

### **Class Regulations:**

During the last few years my courses have been redesigned to have an “open access” policy. For example, you have access to your notebook on tests. Also internet-based instruction is used extensively to help students excel in their courses. As a result the grades have gone up from their historical average of 65 to well over 85. However a small group of students have taken unfair advantage of the course openness and engaged in various violations of academic honesty standards.

For the grading system to be fair to all students it is essential that certain minimal and common-sense standards to be observed by all students.

To enforce these standards I will employ a “penalty schedule” for various infractions. Students are to read the class information here and online, and then sign a statement by the second class meeting stating that they have read, understood, and agreed with class rules and the penalty schedule. As these will be strictly enforced you should take this seriously and if there are issues send an email and come to see me. Please note that the first rule states: “Saying ‘I did not know’ will double the penalty.”

**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.

**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 other coordinates if time permits.
8. Obtain numerical solution of diffusion equations using Matlab, if time permits.

**Topic:** \_\_\_\_\_ **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

**Lectures/Discussions:** We will have traditional lectures augmented by online resources as found on the course website. The course topics, sections, and homework list will be posted as the course progresses.

**Homework:** This counts for 40% of your grade. The lengthy problems will be done in paper format. (They have to be done in a very neat writing.) The shorter ones will be done on the WebAssign software. There are buttons for "show me an example", "ask for extension", "ask your instructor". Short

questions can be answered online, if it is lengthy I will ask you to come and see me in office. Student should consider a homework target deadline for themselves that is 24 hours earlier than the software deadline. Time extension will not be given for Internet/electrical/financial problems. There is an expiration date for each homework. There is a substantial penalty for late submission. Homework from beginning of semester will lose all of its point value by the end of semester. Items on the To-Do list will be counted as homework. The course evaluation is also a homework.

**Project:** Graduate students are to select a project early in the semester in consultation with the instructor and give three reports, one per month, with the final report counting as 10% of their course grade. This is to be typed in TeX and a presentation to be given to class.

**Exams and Grading Policies:** This information is subject to change.

Homework counts as 40% of your grade. Project counts as 10%.

There will be three sectional tests and a cumulative final each counting for 1/8 of the total.

All scratch work during tests will be done on the blue notebook and given to me at the end of each test.

Approximate test dates: R Sept 21, T Oct 9, R Nov 9

Final TBA.

Grading scale: A>90>B>80>C>70>D>60>F.

In case you want your exam to be reviewed and re-graded you need to notify me with an email within one day from the day grades are announced. Two weeks after the final 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 complete detail in an email from you to me and acknowledged in an email from me to you. At the end of final test, and before final grades are given, send a summary email.

**Fair Use Policy (or how to avoid plagiarism charge on homework or take home exams):**

Students are encouraged to try do the homework problems without seeking help. But it is OK to consult other students and resources to learn how to solve homework problems. If you want to seek help on a problem the acceptable process is the following:

- (a) Throw away whatever you have written on that problem so far
- (b) Get input from as many resources as you wish
- (c) Write the solution of the problem all by yourself without looking at any other source
- (d) If you get stuck again go back to step (a)

At the end you should be able to reproduce and justify the steps of the solution you submit. For example by coming to the board and explaining it.

**Mathematical writing rules:** Students are to familiarize themselves with type-setting formulas on WebAssign and its syntax. A hint sheet and common errors is available on course site. Handwritten notes should be very neat. It is preferred that you type it in TeX, especially if you are planning to write a thesis or going to a PhD program.

**Test Code:**

During tests you are to look at your own items/papers/screen and protect your papers from others.

Your face should be visible to the instructor.

No obstruction by sunglasses, hair, hand, caps, etc.

Bring Lamar ID to all tests.

Use of printed sheets, cell phones, electronics, advanced or shared calculators, or loose paper is not allowed.

Use of unauthorized websites and communication with others, is not acceptable during tests.  
Do not give your WebAssign passwords to any other person for any reason.  
Unauthorized logins to WebAssign may result in a grade of F for the course.  
See the penalty schedule for the cost of infractions.  
University academic integrity rules apply (see below).

**Privacy Issues:**

There may be a seating assignment.  
Your activity on computer will be monitored by a program.  
Your papers, calculators, phones etc. may be inspected by the instructor during tests.  
You may be asked to change your seat during a test.  
If you violate the Test Code or class decorum rules you may get a public reminder in class

**Student Resume:** Each student will be make a one-page resume with a photo ID and give me a hard copy and also email the resume. Resume will detail the math courses you have taken, major, expected date of graduation, jobs, responsibilities, skills, career plan, etc. Any specific issue I need to be aware of should go on this page. The photo should be clear, simple and recent, similar to an ID photo.

**Calculator:** You are allowed to have a basic scientific calculator on tests. These cost about \$15 and do not have the following capabilities: graphing, matrix, computer algebra, wireless, or text storage. If you do not have a proper calculator you will take your test without one. Advanced calculators (e.g. TI80), cell phone calculators or sharing is not allowed. See the penalty schedule for the cost of infractions.

**Curving the Grades:** Students usually want to know how to improve their grades. Here are the typical questions and answers, as well as related policies.

Q1. How does doing homework improve my grade?

A. First they count as 50% of the grade. Second: Tests are open notebook and mostly based on problems you have already done.

You are allowed to have one binder of entirely handwritten notes on the tests. Your notebook may contain

- (a) Complete statement of problems and their solutions, from WebAssign or the text.
- (b) Lecture notes.
- (c) Handwritten formula tables from trig/algebra/calculus.
- (d) Table of content and an index.

Please use a binder as loose papers are not allowed. Having printed papers results in a penalty.

Q2. How does attendance improve my test grade?

A. WebAssign questions are similar to the questions in the text, and these are what we will practice in class. Exam questions are very similar to problems done in class so attendance becomes very important.

Q3. How do I improve my exam scores?

A. Try practice tests (under time constraints) before exams. The more of these practice tests you do the higher your grade. On exams you usually have ample time to double check your solutions.

**How to Succeed:**

This class is designed to allow you to get a high passing grade if you consistently apply yourself from beginning.

For your notebook to be effective it needs to be searchable (as in a well-designed website) with page numbers, index, complete statement of problems and solutions, definitions, methods, and summaries.

(Without having done the homework the notebook will not be of much help. So, please do not abuse this privilege!)

Even though you do the homework on WebAssign you should consider writing each problem in your notebook in its entirety so that you can look it up during tests.

**Student Contact Info:** Students are required to have an active email registered with University which shows up on the “class email list”. You are expected to check email nightly. A trial email will be sent and announced in class. If you do not receive it, it is your responsibility to contact the responsible university office to correct the issue.

A small percentage of students do have problems with their emails. It is typically due to not selecting a “preferred email” during registration. Other issues are: misspelling your email, putting parent email, or using email from a cancelled service.

If you ignore this issue, there will be no compensating recourse later.

Please do not change your name or email mid semester.

**Instructor Contact Info:** Your emails to me must be signed by putting your full name (as on the class roll) and the course name and section. You may be contacted with some last minute course information by email. My contact is through the following address: [maesumi@gmail.com](mailto:maesumi@gmail.com) and [maesumi@lamar.edu](mailto:maesumi@lamar.edu). If you leave a phone message for me (8766) please duplicate it by an email. (Please do not use other email addresses, links or clickable addresses to reach me.)

**Absence:** Class roll may be taken. Do not sign for others. Unexcused absences beyond 10% of hours per month may reduce your final grade by 1 point per missed class. Make up for tests requires notification on the same day and submission of verifiable written proof of emergency within one day. An individual decision will be made in each case. The final exam cannot be postponed. See penalty schedule for the results of fake emergency excuse. The grade for an excused missed test may be constructed through adjusted average of other tests.

**No:** Tardiness, food of any type, drinks, gum, ice, chips, candy, noise, music, headsets, e-activity as in surfing, scrolling, texting in class. Please turn off and put your phones and music devices away. Same rules apply when you come for office visits. See penalty schedule for the cost of infractions.

**Teams and Half-time breaks:** We will experiment with having one or two 5 minute break periods when you can ask questions or just walk around. Students may be divided into teams of 2-4 for joint in-class work. You are encouraged to bring a laptop or printout of homework with you to class.

**WebAssign Errors:** These do occur but are very rare. Typically the student has made a typo and thinks it is an error in WebAssign. Please read the syntax hints sheet that is posted online. Usually it is the issue of lower case w vs upper case W, Greek (alpha) vs English (a), 1(one) vs l (ell), 0 vs o, bold font **F** vs ordinary font F, [ ] vs ( ), etc. Keep a record of typical errors to remind yourself on tests.

If you think WebAssign is making a mistake let me know from within WebAssign itself and I will contact the company.

**Extension Time on Tests:** Students typically ask for extension time on tests. This requires unanimous approval. There will be a poll where you indicate if you can come early or leave late by 0, 5, 10, 15 minutes. We will go by what is feasible and approved by all.

**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.

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Important Information for Students

Lamar University expressly prohibits intimidation and harassment of students, faculty, staff, or applicants. <http://students.lamar.edu/academic-support/code-of-conduct.html>

**Drop Policy:** Please make note of the three dates indicated in this drop policy. Any drop will be your responsibility; I will not drop a student from the course.

***September 7, 2016:*** (Census Date-Six Drop Rule does not apply) A student may drop or withdraw without consulting with the instructor. The Six Drop Rule does not apply to a drop before 5:00 PM.

***September 26, 2016:*** (Six Drop Rule applies) A student may drop or withdraw from the course without academic penalty and receive a Q, however, the Six Drop Rule applies. The student will consult with the instructor and the Records Office to initiate a drop.

***October 31, 2016:*** (Six Drop Rule applies) Last day to drop or withdraw with academic penalty; the student must be passing the course at the time of the requested drop in order to receive a Q. The drop form, including all required signatures, must arrive in the Records Office by no later than 4:00 PM. No drop is allowed after this date except in extreme extenuating circumstances. Any “late drop” must be approved by the instructor, department chair, college dean, and provost.

**Academic Integrity:** Students are expected to maintain complete honesty and integrity in their academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Students are specifically warned against all forms of cheating and plagiarism. The *Lamar University Student Handbook* clearly reads: “Any student found guilty of academic dishonesty in any phase of academic work will be subjected to disciplinary action. Punishable offenses include, but are not limited to, cheating on an examination or academic work which is to be submitted, plagiarism, collusion, and the abuse of source materials.” One aspect of the *Handbook*’s definition of cheating includes “purchasing or otherwise acquiring and submitting as one’s own work any research paper or other writing assignment prepared by an individual or firm.” Plagiarism is defined as “the appropriation and the unacknowledged incorporation of another’s work or ideas into one’s own and submitted for credit.” Faculty members in the College of arts and Sciences investigate all cases of suspected plagiarism. Any student who is found cheating in this course will receive a course grade of F. <http://students.lamar.edu/student-handbook.html>

**Accommodations through the Disability Resource Center:** Lamar University is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is located in the Communications building room 105. Office staff collaborate with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at [409-880-8347](tel:409-880-8347) or [drc@lamar.edu](mailto:drc@lamar.edu) to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations. If you are registered with DRC and have a current letter requesting reasonable

accommodations, we encourage you to contact your instructor early in the semester to review how the accommodations will be applied in the course.

<http://www.lamar.edu/disability-resource-center/>

**Campus Closure:** In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage for instructions about continuing courses remotely. <http://lamar.edu>

**Emergency Procedures:** Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at:

<http://www.lamar.edu/about-lu/administration/risk-management/index.html>

Following are procedures for the first two:

**Severe Weather:**

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

**Violence/Active Shooter:**

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND**- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

**Course Evaluations:** You will have an opportunity to evaluate all aspects of this course in a formal process to be completed online near the end of the term. You will receive an email reminder through your LU account.