Math 3150-1
Partial Differential Equations for Engineers
Spring 2021

INSTRUCTOR INFORMATION

- Jingyi Zhu
- Email: zhu@math.utah.edu
- Zoom Handle: `https://utah.zoom.us/j/99701047834`
- Office: LCB 335
- Phone: (801) 581-3236

- Office Hours on Zoom: MoWeFr 1:00 - 2:00 pm, or by appointment.
- Accessibility and Support: the best and most efficient method to contact me is by email to the above address. For general email questions you should expect a response within a day, and I will be available 10 minutes before each class and stay after the class indefinitely.

COURSE DESCRIPTION

Engineering Mathematics Sequence: This is part of the accelerated/honor track.

Prerequisites: Math 2250 and either Math 1260 or Math 2210.

Course Credit Hours: 2

COURSE DETAILS

Course Type: Interactive Video Conferencing (IVC - synchronous online)

Location and Meeting Times: CANVAS, MoWeFr 10:45 - 11:35 am.

Attendance and Punctuality: All students are required to attend classes, each student is allowed up to **six** instances of no-attendance for the semester. If you need to make an exception in order to attend other university activities or for medical and/or other emergency reasons, please contact me and obtain an agreement in writing. Be considerate to other students in the class by attending classes on time.

COVID-19 Considerations: Students must self-report if they test positive for COVID-19 via `https://coronavirus.utah.edu`.

Instructional Support Team: A grader will be assigned within the first two weeks of the semester and he/she will be grading weekly homework assignments in the Canvas grading system. If there is any error in grading, please contact me directly and I will resolve the

issues in a timely manner.

Course Materials: All materials for this course are copyrighted. Do not distribute or share course resources without instructor permission.

- Textbook: Haberman, *Applied Partial Differential Equations with Fourier Series Boundary Value Problems*, 4th or 5th editions, Pearson, (ISBN-13:978-0-13-499543-4, ISBN-10:0-13-499543-0). The e-textbook is viewable in Canvas and you will be automatically OPTED IN to be charged for the text. **Unfortunately the fee is not included in course tuition and you will need to choose to OPT OUT if you obtain the text through other means.**

- Additional course materials: Lecture notes will be posted online in the Canvas system for all registered students according to the schedule below. In addition, I will supply homework solution notes, review materials, sample exam problems and solutions following the schedule in this syllabus.

Technical Requirements:

- Zoom: Students are expected to be computer literate and Zoom navigation skills are expected. Knowledge and navigation of Canvas and Zoom are critical to access all features and resources of this course.

- Internet connection: A strong and reliable internet connection and adequate bandwidth are needed.

- Proctoring exams: We will use Zoom with video enabled to proctor all the exams/quizzes. Please be ready to have a video camera installed on your computer and make sure that it is in proper working condition before the semester starts.

- Matlab: A Matlab license is helpful but not required for this course.

- Canvas: For technical assistance, please review the Canvas Getting Started Guide for Students or contact TLT.

- Loaning laptops: The Marriott Library is loaning laptops to students who need a laptop for classes. For information, please visit

  `https://lib.utah.edu/coronavirus/checkout-equipment.php`

Syllabus subject to change: This syllabus is meant to serve as an outline and guide for our course. Please note that with unforeseen development I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas.

CONTENT OVERVIEW

This is part of the Engineering Mathematics sequence, a product of collaboration between the Engineering College and the Department of Mathematics. In this course, we will start from the modeling of physical problems and the derivations of the equations, to introduce the approaches that lead to Fourier series or Fourier transform representations of the solutions,

and use the classic ideas as stepping stones to explore practical solutions for problems encountered in the real world that can be described by partial differential equations.

COURSE EXPECTED LEARNING OUTCOMES

- Become knowledgable about PDEs arising from classic physical problems and their classifications, be able to derive heat and wave equations based on the idea of flux balancing;
- Appreciate the importance of boundary conditions, and use separation of variables technique for PDEs in finite rectangular regions to reduce the problem to several ODE problems, then be able to construct a series solution for the boundary value problem.
- Understand the ideas of equilibrium and steady solutions, and make a connection between the heat equation and the Laplace's equation;
- Learn about representing functions by Fourier series, as candidates for PDE solutions, and furthermore understand the principle behind the formulas for the coefficients;
- Understand the idea of Fourier transform in conversion of a PDE problem involving unbounded regions, and be able to represent the solution as a Fourier integral.

COURSE DESIGN

We will present the materials using Zoom video conferencing lectures, and giving more attentions to on-the-spot student interactions. Diligent attendance is crucial to the success of the course as we try to overcome the disadvantages caused by the lack of face-to-face interactions. Weekly lecture notes will be posted on Canvas each Monday and you are expected to come to class with questions related to the materials in the note. A 15-minute quiz is given each Monday towards the end of the class to capture the understanding of the materials from the previous week, while a questionnaire will be posted by the weekend to prepare you for the quiz on Monday. If possible, we will form small groups to sketch and solve as many problems as possible, and return home to finish the details.

CLASS SCHEDULE and IMPORTANT DATES

Exam Dates:

- Weekly quizzes: Each Monday at the end of class (11:20 - 11:35 am), except these weeks with a holiday or a non-instructional day scheduled for Monday, or a midterm exam scheduled for Friday of the week.
- Midterm exams: Friday, **Feb 19**, and Friday, **Mar 26**, 10:45-11:35 am.
- Final exam: Wednesday, May 5, 10:30 am - 12:30 pm.

Official Drop/Withdraw Dates: Last day to register without a permission code is January 22. Last day to drop class is January 29. Until March 12 you can withdraw from class with no approval at all. After that date you must petition to your dean's office to be allowed to withdraw. Please check the academic calendar for more information pertaining to dropping and withdrawing from a course. Withdrawing from a course and other matters of registration are the student's responsibility.

Holidays: There will be no class on Monday, February 15 (President's Day), Friday, March 5 and Monday, April 5 (Non-instructional Day).

Course Schedule:

Class No	Date	Section	Topic
1-2	Jan 20 and 22	1.1-2	Introduction to PDEs, Derivation of Heat Equation
3-5	Jan 25, 27 and 29	1.3-4	Boundary Conditions, Equilibrium Distribution
6-8	Feb 1, 3 and 5	1.5, 2.1	Heat Equation in 2 or 3 Dimensions
9-11	Feb 8, 10 and 12	2.2-3	Separation of Variables, Temperature in a Rod
12-13	Feb 17 and 19	2.4	Other Boundary Conditions, **Midterm 1**
14-16	Feb 22, 24 and 26	2.5, 3.1-2	Laplace's Equation, Fourier Series, Convergence
17-18	Mar 1 and 3	3.3-4	Cosine and Sine Series, Term-by-Term Differentiation
19-21	Mar 8, 10 and 12	3.5, 4.1	Term-by-Term Integration, Inner Product Spaces, Introduction to Wave Equation
22-24	Mar 15, 17 and 19	4.2-4	Wave Equation, Vibrating String
25-27	Mar 22, 24 and 26	4.5	Vibrating Membrane, **Midterm 2**
28-30	Mar 29, 31 and Apr 2	4.5-6	Wave Equation in 2-Dimensions
31-32	Apr 7 and 9	10.1-2	Heat Equation on an Infinite Domain
33-35	Apr 12, 14 and 16	10.3-4	Fourier Transform Pair
36-38	Apr 19, 21 and 23	10.5	Fourier Transform and the Heat Equation
39	Apr 26		Course Review
	May 5		**Final Exam**

COMMUNICATION

- All course materials, such as lecture slides, assignments, solutions, grades, etc. will be posted on the Course Canvas site:

  `https://utah.instructure.com/courses/657226`

  Class announcements will be done via email through the Canvas server. You will be responsible for any information contained in them as well as the information announced in class.

- It is your responsibility to also regularly check your Umail (make sure you set up forwarding if you do not check it regularly), your Umail is the only way for me to communicate privately with you, there will be occasions during the semester that we may need to reach out to you individually (e.g. regarding a grade or assignment) and it is in your best interest to respond promptly.

- Feel free to contact me by email for questions at zhu@math.utah.edu, I will do my best to answer emails promptly. I would like to encourage you to email me only if it is something personal that requires individual attention, if instead you have questions about logistics of the class, course material and assignments, and anything else your classmates may wonder as well, please post a question on the Canvas Discussions Board instead. This way the information is shared quickly to the entire class, and each of you can benefit from seeing other classmates questions.
- I will always do my best to ensure the communication relevant to the course is clear and transparent, it is your responsibility as well to keep yourself updated by regularly checking: the announcements on Canvas, your Umail, the posts on the Discussions Board, and pay attention to the announcements given in class and Discussion Section.
- Course Canvas Page: You are expected to log in and check Canvas **everyday** for posted announcements and assignments, and you are also strongly advised to set up notifications for Canvas so you do not miss any important notifications.

EXPECTATIONS FOR ONLINE LEARNING ENVIRONMENT

- Classroom equivalency: Respectful participation in all aspects of the course will make our time together productive and engaging. Zoom lectures, discussion threads, emails and canvas are all considered equivalent to classrooms and student behavior within those environments shall conform to the student code. Specifically:
  - Posting photos or comments that would be off-topic in a classroom are still off-topic in an online posting.
  - Disrespectful language and photos are never appropriate.
  - Using angry or abusive language is not acceptable, and will be dealt with according to the Student Code. The instructor may remove online postings that are inappropriate.
  - Do not use ALL CAPS, except for titles, or overuse certain punctuation marks such as exclamation points and question marks.
  - Course e-mails, e-journals, and other online course communications are part of the classroom and as such, are University property and subject to the Student Code. Privacy regarding these communications between correspondents must not be assumed and should be mutually agreed upon in advance, in writing.
- Other expectations for online communication:
  - Emails: When emailing your instructor and teaching team keep a professional tone. Sign your message with your name and return e-mail address. Please consult this page for tips on how to write appropriate professional emails:
    `https://academicpositions.com/career-advice/how-to-email-a-professor`

  - Treat your instructor, teaching team and classmates with respect in email or any other communication.
  - Remember that all college level communication should have correct spelling and grammar (this includes discussion boards).
  - Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or be offensive to others.
  - Be careful with personal information (both yours and others).

- Electronic or equipment failure: It is your responsibility to maintain your computer and related equipment in order to participate in the online portion of the course. Equipment failures will not be an acceptable excuse for late or absent assignments.

- Online submissions: You are responsible for submitting the assignment with the required naming convention, correct file extension, and using the software type and version required for the assignment.

ASSIGNMENTS, ASSESSMENT AND GRADING

The course grade will be based on weekly homework (20%), weekly quizzes (25%), two midterm exams (30%), and a final comprehensive exam (25%).

- Homework: Weekly assignments will be posted on Canvas each Monday, and submitted on the Canvas system on the following Monday. Late homework will be accepted only with some restrictions (see below), unless it has been requested and approved in advance for extreme circumstances.

- Weekly quizzes: On each Monday except the holiday, non-instructional day, and midterm weeks, there will be a 15-minute quiz. The problems are more conceptual for the emphasis on ideas rather than final answers. Those quizzes are closed book and closed notes. Two lowest quiz scores will be dropped from the computation of the course grade.

- Midterms: There will be two 50-minute midterm exams on **Fridays, Feb 19 and Mar 26**. These midterm exams are **not** comprehensive. Under special circumstances, arrangements can be made to take the exam at an earlier time, but no makeup exam will be arranged.

- Final Exam: **Wednesday, May 5, 2021**, 10:30 am - 12:30 pm. The final exam will be held online with a Zoom proctor setting. The final exam is a comprehensive exam, covering all materials discussed in the semester.

- Exam Policies: All the midterm and final exams will be closed book exams. You are allowed to bring a 5×7 index card with your own handwritten notes.

Late Assignments/Missed Assignments/Regrading Policies: Assignments submitted late within one week after the due date can be accepted with a 50% reduction in credit.

Table 1: Grading Scales

%-age	90-100	85-89	80-84	75-79	70-74	65-69	60-64	55-59	45-54	0-44
Grade	A	A-	B+	B	B-	C+	C	C-	D	E

If you have an emergency situation that would result in late completion, you will need to e-mail the instructor before the original due date to explain and request an extension. Proper adjustment can be made only after the request is granted. Regrading is only performed if the mistake is caused by the instructor or the teaching team.

Incompletes: According to university policy, to be considered for an incomplete, a student must have 20% or less of the course work remaining and be passing the course with a C or better. You must request an incomplete grade and I will consider giving that grade only under exceptional circumstances.

ACADEMIC CODE OF CONDUCT

Students are encouraged to review the Student Code for the University of Utah:

`https://regulations.utah.edu/academics/6-400.php`

In order to ensure that the highest standards of academic conduct are promoted and supported at the University, students must adhere to generally accepted standards of academic honesty, including but not limited to refraining from cheating, plagiarizing, research misconduct, misrepresenting one's work, and/or inappropriately collaborating. A student who engages in academic misconduct as defined in Part I.B. may be subject to academic sanctions including but not limited to a grade reduction, failing grade, probation, suspension or dismissal from the program or the University, or revocation of the student's degree or certificate. Sanctions may also include community service, a written reprimand, and/or a written statement of misconduct that can be put into an appropriate record maintained for purposes of the profession or discipline for which the student is preparing.

ADDITIONAL POLICIES AND RESOURCES

Discrimination and Harassment: If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or Office of the Dean of Students, 270 Union Building, 801-581-7066. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS). Please see Student Bill of Rights, section E

`http://regulations.utah.edu/academics/6-400.php`

Undocumented Student Support: Immigration is a complex phenomenon with broad impact – those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status

presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801.213.3697 or visit `https://dream.utah.edu`.

Veterans Center: If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5 pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: `http://veteranscenter.utah.edu/`. Please also let me know if you need any additional support in this class for any reason.

Wellness Statement: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a students ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at `https://wellness.utah.edu` or 801-581-7776.

Student Success Advocates: The mission of Student Success Advocates is to support students in making the most of their University of Utah experience (`http://ssa.utah.edu`). They can assist with mentoring, resources, etc. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact a Student Success Advocate for support.

The Americans with Disabilities Act: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, including sexual orientation or gender identity/expression, you are encouraged to report it to the Universitys Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or to the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS).

Campus Safety: The University of Utah values the safety of all campus community mem-

bers. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit `https://safeu.utah.edu`.

University Counseling Center: The University Counseling Center (UCC) provides developmental, preventive, and therapeutic services and programs that promote the intellectual, emotional, cultural, and social development of University of Utah students. They advocate a philosophy of acceptance, compassion, and support for those they serve, as well as for each other. They aspire to respect cultural, individual and role differences as they continually work toward creating a safe and affirming climate for individuals of all ages, cultures, ethnicities, genders, gender identities, languages, mental and physical abilities, national origins, races, religions, sexual orientations, sizes and socioeconomic statuses.

Office of the Dean of Students: The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. Please consider reaching out to the Office of Dean of Students for any questions, issues and concerns. 200 South Central Campus Dr., Suite 270. Monday-Friday 8 am-5 pm.