

**Math 3150-002**  
**Partial Differential Equations (PDEs) for Engineers**  
**Fall 2021**

**Instructor info** \_\_\_\_\_

**Name** Wesley Hamilton

**Please call me** Wesley, or Dr. Hamilton, or Professor (Wesley/Hamilton)

**Pronouns** he/him/his

**Email** hamilton@math.utah.edu

**Office** LCB 202

**Office hours** – In-person time/room TBD  
– Zoom time/room TBD, and by appointment

**Course info** \_\_\_\_\_

**Pre-requisites** “C” or better in ((MATH 2250 OR (MATH 2270 AND MATH 2280) AND (MATH 2210 OR MATH 1260 OR MATH 1280 OR MATH 1321))

**Credit hours** 2

**Class number** 1171

**Meeting time** MoWeFr 8.35am-9.25am

**Meeting location** WEB L102

**Course resources** \_\_\_\_\_

**Books** – (Required) “Applied Partial Differential Equations with Fourier Series and Boundary Value Problems”, Fifth edition by Haberman  
\* Available on Canvas.  
– “Partial Differential Equations for Scientists and Engineers” Reprint edition, by Farlow  
– “Schaum’s Outline of Partial Differential Equations”, Third edition, by DuChateau and Zachmann

**Videos** – Math 3150 video series by Will Nesse  
– 3Blue1Brown introduction to differential equations, including some videos on PDEs

## Course communication

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- All course content will be posted on the course Canvas site.
- The best way to get in contact with me is by email.
- Any questions about the course and course content should be posted to the Canvas discussions tab.
- It is your responsibility to regularly check Canvas for course materials and announcements.

## Course description

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Fourier series and boundary-value problems for the wave, heat, and Laplace equations, separation of variables in rectangular and radial geometries, Fourier transform.

## Learning objectives

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By the end of this course, students will be able to:

- derive the heat and wave equation from physical principles, in 1D and higher dimensions,
- recognize and set up boundary conditions for physically relevant PDEs,
- use separation of variables to construct solutions to simple PDEs,
- use eigenfunction and series expansions to construct solutions to PDEs on bounded domains,
- use the Fourier transform to construct solutions to PDEs on infinite and semi-infinite domains.

## Assessments and grading

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- Assessments**
- Weekly homework
    - \* Designed to provide practice with concepts and skills covered in class
    - \* For each homework assignment, students have one opportunity to submit corrections to earn back some missed points
  - Two midterms
    - \* Exams are cumulative, in so far as topics covered in class build on each other
    - \* Students have one opportunity to submit corrections to earn back some missed points
  - Final exam

- \* Cumulative final exam covering all course content
- \* Scheduled for **Dec. 17, 8.00-10.00 am** per university scheduling

**Grading** – Final grade will be determined by the formula

$$25\%HW + 20\%MT_1 + 20\%MT_2 + 35\%Final$$

– Percentage computed above will be converted to a letter grade by the following table:

% range	93+	90-92	87-89	83-86	80-82	77-79	73-76	70-72	60-69	59-
Grade	A	A-	B+	B	B-	C+	C	C-	D	F

### Important dates \_\_\_\_\_

- Holidays**
- Labor day, Mon. Sep. 6
  - Fall Break, Sun.-Sun. Oct. 10-17
  - Thanksgiving Break, Thurs.-Sun. Nov. 25-28
  - Holiday Recess, begins Sat. Dec. 18

- University dates**
- Classes begin, Mon. Aug. 23
  - Last day to add without a permission code, Fri. Aug. 27
  - Last day to wait list, Fri. Aug. 27
  - Last day to add, drop, elect CR/NC, or audit classes, Fri. Sep. 3
  - Last day to withdraw from classes, Fri. Oct. 22 Last day to reverse CR/NC option, Fri. Dec. 3
  - Classes end, Thurs. Dec. 9
  - Reading day, Fri. Dec. 10
  - Final exam period, Mon.-Fri. Dec. 13-17

- Exams**
- Midterm 1, week of Oct. 4-8
  - Midterm 2, week of Nov. 22 - 26
  - Final exam, Dec. 17, 8.00-10.00 am

### Course schedule \_\_\_\_\_

This course is divided into 4 “units” (sections refer to Haberman):

1. Conservation laws and physical origins of PDEs (§1.1-1.5, 4.1 - 4.3);
2. Separation of variables (§2.1-2.5);
3. Fourier series and problems on bounded domains (§3.1-3.6, §4.4-4.5);

4. Fourier transform and problems on unbounded domains (§10.1 - 10.6).

A tentative schedule for the semester is:

<b>Week</b>	<b>Sections</b>	<b>Topics</b>
1: Aug. 23 - 27	1.1, 1.2, 1.3	
2: Aug. 30 - Sep. 3	1.4, 1.5, 4.1, 4.2	
3: Sep. 6 - 10	4.3	<b>Labor Day</b>
5: Sep. 13 - 17	2.1, 2.2, 2.3	
6: Sep. 20 - 24	2.3, 2.4, 2.5	
7: Sep. 27 - Oct. 1	2.5, 3.1, 3.2	
8: Oct. 4 - 8	3.3, <b>Midterm 1</b>	
9: Oct. 11 - 15		<b>Fall Break</b>
10: Oct. 18 - 22	3.4, 3.5	
11: Sep. 25 - 29	3.6, 4.4, 4.5	
12: Nov. 1 - 5	10.1, 10.2	
13: Nov. 8 - 12	10.3, 10.4	
14: Nov. 15 - 19	10.5	
15: Nov. 22 - 26	<b>Midterm 2</b>	<b>Thanksgiving Break</b>
16: Nov. 29 - Dec. 3	10.6	
17: Dec. 6 - 10	Review	
18: Dec. 13 - 17		<b>Final exam!</b> Dec. 17, 8.00-10.00 am

## COVID policies

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University leadership urges all faculty, students, and staff to model the vaccination, testing, and masking behaviors we want to see in our campus community. These include:

**Vaccination:** Get a COVID-19 vaccination if you have not already done so. Vaccination is proving highly effective in preventing severe COVID-19 symptoms, hospitalization and death from coronavirus. Vaccination is the single best way to stop this COVID resurgence in its tracks. Visit <http://mychart.med.utah.edu>, <http://alert.utah.edu/covid/vaccine>, or <http://vaccines.gov> to schedule your vaccination.

**Masking:** While masks are no longer required outside of Health Sciences facilities, UTA buses and campus shuttles, CDC guidelines now call for everyone to wear face masks indoors.

**Testing:** If you are not yet vaccinated, get weekly asymptomatic coronavirus tests. This is a helpful way to protect yourself and those around you because asymptomatic individuals can unknowingly spread the coronavirus to others. Saliva based testing is available at <https://alert.utah.edu/covid/testing>.

**Self-Reporting:** All of us, including faculty, students, and staff, must self-report if we test positive for COVID-19 via this website: <https://coronavirus.utah.edu>.

## University policies

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**ADA statement** 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 this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

**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, office for equal opportunity and affirmative action including sexual orientation or gender identity/expression, you are encouraged to report it to the University's Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, <https://oeo.utah.edu/contact-us/index.php> or to the Office of the Dean of Students, 270 Union Building, 801-581-7066, <https://deanofstudents.utah.edu>. 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), <https://police.utah.edu>.

**Campus safety** The University of Utah values the safety of all campus community members. To report suspicious activity, 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 UCC staff is committed to supporting the mental health needs of our campus community. Their phone number is 801-581-6826. Their hours are Monday-Friday, 8:00am-5:00pm. For after-hours emergencies, contact the 24/7 Crisis Line: 801-587-3000. More information is at <https://counselingcenter.utah.edu>.

**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. To contact the Office of the Dean of Students, please email [deanofstudents@utah.edu](mailto:deanofstudents@utah.edu) or call 801-581-7066. There is more information at <https://deanofstudents.utah.edu>.

**Student Names & Personal Pronouns** Class rosters are provided to the instructor with the student's legal name as well as "Preferred first name" (if previously entered by you in the Student Profile section of your CIS account, which can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center: <https://lgbt.utah.edu/resources/index.php>.

**Diversity/Inclusivity Statement**

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you. (Source: University of Iowa College of Education)

**Undocumented Student Support Statement**

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>.

**Wellness Statement**

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

**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 8-5pm. 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.

**Learners of English as an Additional/Second Language**

If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (<http://writingcenter.utah.edu>); the Writing Program (<http://writing-program.utah.edu>); the English Language Institute (<http://continue.utah.edu/eli>). Please let me know if there is any additional support you would like to discuss for this class.