Department of Mathematics, University of Utah

Partial Differential Equations for Engineering Students

MATH 3150 – Section 004 – Spring 2019

Course Information and Syllabus

Updated January 22, 2019

Instructor:	Akil Narayan
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Phone:	801-581-8984
Office:	WEB 4666 or CSC 214D
Office hours:	Monday 2:30-4pm, Tuesday 3:30-5pm
Office hours location:	WEB 4666

Class time and location: MW, 6:00pm-7:20pm, WEB 1450

Section webpage: http://www.sci.utah.edu/~akil/math3150

Course Information: This is a 2-credit course.

Learning objectives: Upon successful completion of this course, a student should be able to:

- understand and practice modeling of classical physics problems leading to partial differential equations (PDE)
- identify and classify spatial and temporal PDE
- represent functions via Fourier series respresentations, and understand concepts related to convergence
- use separation-of-variables methods to solve PDEs over tensorial domains
- understand and use Fourier transforms for PDEs on infinite domains

Prerequisites: ODE and linear algebra (MATH 2250, or MATH 2270 and MATH2280), and multivariable calculus (MATH 2210 or MATH 1260 or MATH 1280 or MATH 1321).

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

Text: Required: *Applied Partial Differential Equations with Fourier Series Boundary Value Problems* (5th edition), Richard Haberman, Pearson, 2019, ISBN 9780134995434. We will be using chapters 1-4 and 10 of this text.

Homework: Problem sets will be announced in-class and subsequently posted on the course website. Homework will be divided into weekly assignments and collected in-class on Wednesdays. Only paper (hard) copies of assignments will be accepted; electronic copies will *not* be accepted. Late assignments of any form will <u>*not*</u> be accepted without either prior approval from the instructor, or if a student provides documentation showing extenuating circumstances.

Each homework assignment is worth equal weight, and over the course of the semester, your lowest homework score will be dropped.

Quizzes: Each week on Wednesday in-class, a short 5-10 minute quiz will be given. (There will be no quizzes during weeks when midterm exams are held.) Quizzes are meant to reinforce overarching concepts and emphasize understanding of principles rather than mathematical computation.

Each quiz is worth equal weight, and over the course of the semester, your lowest quiz score will be dropped.

Exams: This course will have 2 in-class midterm exams, in addition to 1 in-class comprehensive final exam. The midterm exams will be held in class on Wednesdays February 20, and March 27.

The final exam is a cumulative exam in the same format as the midterm exams. The final exam will be held on Monday, April 29 from 6:00-8:00pm in the normal class meeting room, WEB 1450.

Unless otherwise specified, **neither calculators nor notes of any kind are allowed on any of the exams or quizzes**.

Grading: Your course grade will be computed as follows.

- Homework 25%
- Quizzes 10%
- Midterm exams ..... 2 x 20%
- Final exam 25%

Final letter grades will be assigned based on the following scheme:

- 92% - 100% — A
- 90% - 91% — A−
- 88% - 89% — B+
- 82% - 87% — B
- 80% - 81% — B−
- 78% - 79% — C+
- 72% - 77% — C
- 70% - 71% — C−
- 68% - 69% — D+
- 62% - 67% — D
- 60% - 61% — D−
- 0% - 59% — E

Important dates:

Jan 18		Last day to add, drop (delete), elect CR/NC, or audit classes
Feb 20		Midterm 1
Mar 8		Last day to withdraw from classes
Mar 27		Midterm 2
Apr 19		Last day to reverse CR/NC option
Apr 24		Reading Day
April 29	**6:00pm**	Final exam

Tutoring: The Department of Mathematics provides free tutoring services through the Tutoring Center for many 1000-level, 2000-level, and for some 3000-level courses. The Tutoring Center provides services for MATH 3150, and is located in room 155 of the T. Benny Rushing Mathematics Center, between buildings JWB and LCB. Please see `https://www.math.utah.edu/undergrad/mathcenter.php` for attending information about the Tutoring Center and for hours of operation.

Class communication: An email list is set up with which I shall send out information not communicated during class. This email list will also be used to communicate class information in the case of unusual circumstances affecting the the logistics of the class. If you are not officially registered for the class but wish to be on the roster, please discuss it with me.

If you are registered for the course, but do not receive the course email announcements to your University of Utah email address, please notify me immediately. It is not possible for me to arrange delivery of these emails to a non-Utah account, but you can forward your Utah emails to other email addresses. (Navigate to `http://www.cis.utah.edu`, login, and change your UMail settings.)

The section website will be used to communicate more technical matter of the class (e.g. problem sets, lecture summaries, etc.).

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to change that may be necessitated by a revised semester calendar or other circumstances. The above two methods, in addition to the coursewide website, are reliable means of getting information about changes to the course.

ADA Statement: 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 Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS 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 Services.

Student responsibilities and integrity: All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, and I will do so, beginning with verbal warnings and progressing to dismissal from and class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.
`http://regulations.utah.edu/academics/6-400.php`

Semester calendar

(Subject to change!)

Day	Date	Text Section(s)	Topic
Monday	January 7, 2019	12.1	Hello
Wednesday	January 9, 2019	1.2	The heat equation, flux, and conservation
Monday	January 14, 2019	1.3 – 1.5	Boundary conditions and physical interpretations
Wednesday	January 16, 2019	2.1	Linear equation solutions and the heat equation
Monday	Januaray 21, 2019	2.1	No Class: Martin Luther King Jr. Day
Wednesday	January 23, 2019	2.2	Linear equation solutions and the heat equation
Monday	January 28, 2019	2.3	Separation of variables
Wednesday	January 30, 2019	2.3	Separation of variables
Monday	February 4, 2019	2.3	Separation of variables
Wednesday	February 6, 2019	2.4	Insulated boundaries, superposition
Monday	February 11, 2019	2.5	Laplace's equation
Wednesday	February 13, 2019	—	Review
Monday	February 18, 2019	—	No Class: President's Day
Wednesday	February 20, 2019	—	**MIDTERM EXAM 1**
Monday	February 25, 2019	—	No Class
Wednesday	February 27, 2019	—	No Class
Monday	March 4, 2019	3.1 – 3.2	Fourier Series
Wednesday	March 6, 2019	3.3	Fourier sine and cosine series
Monday	March 11, 2019	—	No Class: Spring break
Wednesday	March 13, 2019	—	No Class: Spring break
Monday	March 18, 2019	4.1 – 4.2	The wave equation
Wednesday	March 20, 2019	4.1 – 4.2	Solving the wave equation
Monday	March 25, 2019	—	Review
Wednesday	March 27, 2019	—	**MIDTERM EXAM 2**
Monday	April 1, 2019	10.1 – 10.2	Continuous Fourier transforms
Wednesday	April 3, 2019	10.1 – 10.2	Continuous Fourier transforms
Monday	April 8, 2019	10.3	Fourier transform properties
Wednesday	April 10, 2019	10.3	Fourier transform properties
Monday	April 15, 2019	10.4	The heat kernel
Wednesday	April 17, 2019	10.4	D'Alembert's solution
Monday	April 22, 2019	—	Review
Wednesday	April 24, 2019	—	No Class: Reading Day
Monday	April 29, 2019	6:00pm-8:00pm	**FINAL EXAM**