Department of Mathematics, University of Utah

Partial Differential Equations for Engineering Students

MATH 3150 – Section 004 – Spring 2018

Course Information and Syllabus

Updated February 21, 2018

Instructor:	Akil Narayan
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Office:	WEB 4666

Office hours:	Monday 3pm-5pm, Tuesday 10am-12pm
Office hours location:	WEB 4666

Class time and location: MW, 6:00pm-7:20pm, WEB (Warnock) 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: Edwards, Penney, and Haberman, *Linear Algebra and Differential Equations: with Introductory Partial Differential Equations*, (ISBN-13: 978-1-269-42557-5). The text is a University of Utah custom edition specially designed for the engineering math sequence.

If you would just like to purchase a text for 3150, either a 4th edition or 5th edition of Haberman's text (*Applied Partial Differential Equations with Fourier Series Boundary Value Problems*, ISBN 978-0-321-90567-3) will do. Chapters 1-4 and 10 of the Haberman text will suffice.

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 *not* 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 15 and March 29.

The final exam is a cumulative exam in the same format as the midterm exams. The final exam will be held on Monday, April 30 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 19		Last day to add, drop (delete), elect CR/NC, or audit classes
Feb 14		Midterm 1
Mar 2		Last day to withdraw from classes
Mar 14		Midterm 2
Apr 20		Last day to reverse CR/NC option
Apr 25		Reading Day
April 30	**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 8, 2017	12.1	Hello
Wednesday	January 10, 2017	12.2	The heat equation, flux, and conservation
Monday	January 15, 2017	—	No Class: Martin Luther King Jr. Day
Wednesday	January 17, 2017	12.3 – 12.5	Boundary conditions and physical interpretations
Monday	Januaray 22, 2017	13.1	Linear equation solutions and the heat equation
Wednesday	January 24, 2017	13.2	Linear equation solutions and the heat equation
Monday	January 29, 2017	13.3	Separation of variables
Wednesday	January 31, 2017	13.3	Separation of variables
Monday	February 5, 2017	13.4	Insulated boundaries, superposition
Wednesday	February 7, 2017	13.5	Laplace's equation
Monday	February 12, 2017	—	Review
Wednesday	February 14, 2017	—	**MIDTERM EXAM 1**
Monday	February 19, 2017	—	No Class: President's Day
Wednesday	February 21, 2017	14.1 – 14.2	Fourier Series
Monday	February 26, 2017	14.3	Fourier sine and cosine series
Wednesday	February 28, 2017	—	No Class
Monday	March 5, 2017	15.1 – 15.2	The wave equation
Wednesday	March 7, 2017	15.1 – 15.2	Solving the wave equation
Monday	March 12, 2017	—	Review
Wednesday	March 14, 2017	—	**MIDTERM EXAM 2**
Monday	March 19, 2017	—	No Class: Spring break
Wednesday	March 21, 2017	—	No Class: Spring break
Monday	March 26, 2017	16.1 – 16.2	Continuous Fourier transforms
Wednesday	March 28, 2017	16.1 – 16.2	Continuous Fourier transforms
Monday	April 2, 2017	16.3	Fourier transform properties
Wednesday	April 4, 2017	16.3	Fourier transform properties
Monday	April 9, 2017	16.4	The heat kernel
Wednesday	April 11, 2017	16.4	D'Alembert's solution
Monday	April 16, 2017	—	No Class
Wednesday	April 18, 2017	—	No Class
Monday	April 23, 2017	—	Review
Wednesday	April 25, 2017	—	No Class: Reading Day
Monday	April 30, 2017	6:00pm-8:00pm	**FINAL EXAM**