



MA-52000 Spring 2023

Course: Boundary Value Problems of Differential Equations

CRN: 16863

Time: MWF 1:30p-2:20p, Jan 09-Apr 28, 2023

Location: REC 122 (SCHM 122)

Instructional Modality: Face to Face

Instructor: Yuan GAO

Office hour: Tu/Fr noon-1:30pm; or other time via Email appointment

Office Location: Math 736

Email: gao662@purdue.edu

Office Phone number: 765-496-0056

Description:

Credit Hours: 3.00. This is a graduate-level course introducing Fourier series, Fourier transform, boundary value problems, orthogonal bases and their applications on solving linear PDEs, including heat equation, wave equation, Poisson equation, etc.

Texts:

1. **Main textbook:** *Fourier Analysis and Its Applications*, by *G. B. Folland*. HW will be assigned according this textbook. (The one published by Brooks/Cole in 1992 and the one reprinted by the American Mathematical Society in 2009 are exactly the same.)
2. Other references: There are lots of references and online-resources on Fourier analysis, for instance, *Fourier Analysis*, by Korner and Youtube.
3. Notes taken in class or posted on Brightspace.

Important prerequisites:

Linear algebra, differential equations (ODEs), mathematical analysis (concepts of convergence) and mathematical maturity.

There may be deviations from the schedule below, depending on class progress.

Approximated Schedule (subject to changes):

Chapter sections refer to the main textbook.

1. Week of Jan. 11, § 1.1-1.2;
2. Week of Jan. 18, § 1.3,2.1; no class on Martin Luther King Day
3. Week of Jan. 25, § 2.2-2.4;
4. Week of Feb. 01, § 2.5, 3.1-3.2;
5. Week of Feb. 08, § 3.3-3.4;
6. Week of Feb. 15, § 3.5, 4.1; Midterm 1 on 02/13;
7. Week of Feb. 22, § 4.2-4.3;
8. Week of Mar. 01, § 4.4-4.5;
9. Week of Mar. 08, §5.1-5.3;
10. Week of Mar. 15; Spring Break, no class;

11. Week of Mar. 22, § 5.4-5.6
12. Week of Mar. 29, Midterm 2 on 3/27; §6.1-6.2;
13. Week of Apr. 05, § 6.3-6.4 (6.5);
14. Week of Apr. 12, § 7.1-7.2
15. Week of Apr. 19, § 7.3-7.4
16. Week of Apr. 26, Review or optional topics (content excluded in final)

Final Exam is on the exam week May1-6.

Grading System:

1. Homework: 30%

- Weekly assignments based on lectures and encouraged readings. A very significant portion of your final grade.
- A weekly assignment from the homework problem list will usually be due on **Wednesday** (to be submitted via Gradescope to the TA; link: <https://www.gradescope.com>). The assignment will be posted on Gradescope per week, with **a specific due time. Missing homework counts as 0**; see policy below.
- There are around 5-10 Problems in each homework. Only 5 Problems in each homework will be graded per week. Each written homework will be graded on a scale of 0-10.
- There are totally 11 HWs, an average of your highest 10 scores for HWs will be your final HW grade.

2. In-class midterms: 20%+20%

- Three (**closed-book, 50min, in-class exams**). A very significant portion of your final grade.
- To be taken in the week indicated in the schedule.

3. Final exam: 25%

- A final exam (**90min, closed-book exam** during the exam week). A very significant portion of your final grade.

4. Class attendance and activity: 5%

- +1% (resp. +2%) for actively answering questions (resp. proposing alternative solutions)
- -2% for being absent twice without proper reasons

•Missed course work is officially accommodated in the following three circumstances:

1. **Illness or other extraordinary personal circumstance**
2. **Religious observance**
3. **Varsity athletic participation**

Late work for any other reason will not be accepted.

Grades policy

Students who get at least 97% of the total points in this course are guaranteed an A+,

93% an A

90% an A-

87% a B+
83% a B
80% a B-
77% a C+
73% a C
70% a C-
67% a D+
63% a D
and 60% a D-

Above is departmental policy for the grade cut-offs. For each of these grades, it's possible that at the end of the semester a lower percentage will be enough to get that grade.

Expectations:

- This is an advanced course with high expectations. Your submitted work should reflect your best effort. Solutions should be complete, legible, and easily understood. Complete sentences expressing well-developed ideas should be used whenever appropriate.
- The goal of the course is to not only learn those classical method in the textbook but also learn the way of thinking. These fundamental ideas will (hopefully) influence the way you think and the way you solve problems. Thus, our goal is to not only teach you the content outlined in the course synopsis, but to also more broadly impact the way you think about problems in your chosen discipline.
- During reading and working out HWs, it is highly encouraged to explain concept, hear it from others in some different angles, and to answer other people's doubts, which will solidify one's own understanding.

Academic Integrity

Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494- 8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.

Direct copying from (or too close to) other works or online materials is not allowed. Any form of cheating in exams will automatically lead to an F grade.

All materials, including Projects and HWs posted on the Brightspace of this course subject to my copyright and cannot be bartered.

Academic Guidance in the Event a Student is Quarantined/Isolated

If you must quarantine or isolate at any point in time during the semester, contact the Protect Purdue Health Center at 765-496-4636. Please also reach out to me via email so that we can communicate about how you can continue to learn remotely. Work with the Protect Purdue Health Center (PPHC) to get documentation and support, including access to an Academic Case Manager who can provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Your Academic Case Manager can be reached at acmq@purdue.edu. Importantly, if you find yourself too

sick for an extended period of time to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation.

Classroom Guidance Regarding Protect Purdue

Please refer to the [Protect Purdue Plan](#) including the Protect Purdue Pledge, for campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines.

Please refer to the latest Protect Purdue Pledge and Classroom Expectation below.

<https://protect.purdue.edu/pledge/>

https://www.purdue.edu/innovativelearning/download/sop-for-classrooms-instructional-lab-experiential-course_fall-2022/?wpdmdl=4557&refresh=62e7f410521841659368464

Lack of compliance

Students who are not engaging in behaviors established in the standard operating procedures (e.g., properly wearing a mask when required) will be asked to comply and offered any assistance they need in order to comply. If non-compliance continues, possible results include instructors asking students to leave the class, potentially followed by instructors dismissing the whole class. Students who do not comply with the required health and Protect Purdue Pledge behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office, with sanctions ranging from educational requirements to dismissal from the university. For additional guidance, please see the Dean of Students guidance on Managing Classroom Behavior and Expectations.

Student rights

Any student who has substantial reason to believe that another person in the room is threatening class safety by not wearing a face covering or following other safety guidelines for public health considerations may leave the class without consequence. The student is encouraged to report the observed behavior to the course instructor or to the Office of Student Rights and Responsibilities (OSRR), as well as discuss next steps with the instructor.

Accommodations for Students with Disabilities and Academic Adjustment:

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone at 765-494-1247.

If you have been certified by the Disability Resource Center (DRC) as eligible for accommodations, you should contact your instructor to discuss your accommodations as soon as possible. Here are instructions for sending your Course Accessibility Letter to your instructor: <https://www.purdue.edu/drc/students/course-accessibility-letter.php>

Nondiscrimination Statement:

This class, as part of Purdue University's educational endeavor, is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential.

Mental Health/Wellness Statement

Help-seeking is a life skill rather than an indication of weakness.

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one- on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Emergency Preparation

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis. A link to Purdue's Emergency Preparedness resources (also located on the Brightspace shell under University Policies) https://www.purdue.edu/ehps/emergency_preparedness/