



Syllabus MA/CS 615 Spring 2022

Course Information

- **MA/CS 615** Numerical Methods For Partial Differential Equations
- **Location & time:** REC 114 Tue/Thurs 1:30pm-2:45pm
- **Instructional Method:** Face-to-Face, or via a synchronous zoom streaming (Brightspace->MA615->Content->Zoom->Click Lectures to Join, code is 47907). In zoom, you will be muted and you can type your questions in chat on zoom. No guarantee that questions will be seen/answered immediately though.
- **Course webpage:** https://www.math.purdue.edu/~zhan1966/teaching/615/615_2022S.html

Instructor Contact Information

- **Name of the instructor** [Xiangxiong Zhang](#) (feel free to call me X)
- **Office Location** MATH 406
- **Email** zhan1966@purdue.edu
- **Office hours** 1:30pm-3pm on Wed, or other time (or through zoom) by appointment.

Course Description

This is an introductory course of numerical solutions to partial differential equations for any graduate students interested in computational mathematics, with emphasis on breadth rather than depth. The course will cover key concepts with a balance between analysis and implementation, including accuracy, stability and convergence of finite difference methods for time-dependent problems such as wave equations, parabolic equations and conservation laws. The finite element method for elliptic equations on structured meshes, which are equivalent to finite difference schemes, will also be introduced. Linear system solvers such as the conjugate gradient method and the multigrid method, and ODE solvers such as Runge-Kutta method will be discussed, if time permits. Homework and the final exam will consist of both analysis and coding by Matlab. Sample Matlab codes will be provided thus prior knowledge of coding is not required. Recommended prerequisites include linear partial differential equations, linear algebra, and Fourier analysis, all of which will be reviewed during the lectures.

Learning Resources, Technology & Texts

- Lecture notes will be posted on course webpage.
- Homework solutions will be posted on brightspace after due day.
- Feel free to discuss homework problems on piazza (Brightspace->Content->piazza). But you have to write your own homework.
- Recommended reference books can be found on the course webpage.

Homework Assignments & Final Exam

1. We will have about four to six sets of homework problems, and one take-home final exam. Both analysis and coding will be involved. MATLAB is the required coding tool. Sample MATLAB codes will be provided thus no prior coding skills are necessary.
2. Submit on gradescope (Brightspace->content->gradescope, Entry Code:743Y6B).
3. **Late homework will not be accepted.** Exceptions may be considered for either a well justified and documented reason with prior notifications or an emergency.
4. OK to discuss it on piazza (sign up in the announcement on brightspace) but you have to write your own homework.

Grading Scale

The final grade consists of approximately 60-70 % of homework and 30-40 % of take-home final exam: 85% guarantees an A, 70% guarantees a B. It's possible that at the end of the semester a somewhat lower percentage will be enough to get that grade.

Intellectual Property

Lecture notes, videos, homework solutions, exam problems and solutions are all copyrighted. Uploading any of these to any forum/website is strictly prohibited.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. 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.

Incidents of academic misconduct in this course will be addressed by the course instructor and referred to the Office of Student Rights and Responsibilities (OSRR) for review at the university level. Any violation of course policies as it relates to academic integrity will result minimally in a failing or zero grade for that particular assignment, and at the instructor's discretion may result in a failing grade for the course. In addition, all incidents of academic misconduct will be forwarded to OSRR, where university penalties, including removal from the university, may be considered.

Policy during COVID-19

Students are expected to attend all classes in-person unless they are ill or otherwise unable to attend class. If they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus, students should stay home and contact the Protect Purdue Health Center (496-INFO).

Most specifically, students must refrain from attending class in person if they are exhibiting any symptoms of COVID-19, are otherwise ill, or are advised to isolate/quarantine. If students exhibit symptoms of COVID-19 or have been in contact with someone who has tested positive, it is critical they contact the Protect Purdue Health Care Center (PPHC) and follow their recommendations including testing, quarantining, or isolation.

In the current context of COVID-19, in-person attendance cannot be a factor in the final grades. However, timely completion of alternative assessments can certainly be part of the final grade. Students need to inform the instructor of any conflict that can be anticipated and will affect the timely submission of an assignment or the ability to take an exam.

Classroom engagement is extremely important and associated with your overall success in the course. The importance and value of course engagement and ways in which you can engage with the course content even if you are in quarantine or isolation, will be discussed at the beginning of the semester. Student survey data from Fall 2020 emphasized students' views of in-person course opportunities as critical to their learning, engagement with faculty/TAs, and ability to interact with peers.

Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflicts, when advance notification to an instructor is not possible, the student should contact the instructor/instructional team as soon as possible by email, through Brightspace, or by phone. In cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via [email](#) or phone at 765-494-1747. Our course Brightspace includes a link to the Dean of Students under 'Campus Resources.'"

Academic Guidance in the Event a Student is Quarantined/Isolated

If you must quarantine or isolate at any point in time during the semester, please 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 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.

Protect Purdue

The [Protect Purdue Plan](#), which includes the [Protect Purdue Pledge](#), is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask [in classrooms and campus building](#), at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace before and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health 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.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not properly wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the [Office of the Student Rights and Responsibilities](#). See also [Purdue University Bill of Student Rights](#).

Nondiscrimination Statement

A link to Purdue's Nondiscrimination Policy Statement can be found here:

https://www.purdue.edu/purdue/ea_eou_statement.php

Accessibility

Purdue University strives to make learning experiences as accessible as possible. 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: 765-494-1247.

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [WellTrack](#). Sign in and find information and tools at your fingertips, available to you at any time.

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.