

MATH 540, NUMERICAL COMPUTING– FALL 2021

Instructor: Gideon Simpson
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Lectures: Tuesdays & Thursdays, 3:30PM-4:50PM, GL44

COURSE DESCRIPTION

Intended to introduce students to contemporary computing environments and the associated tools. Uses contemporary software tools and specific applications from science and engineering to illustrate numerical and visualization methods.

PREREQUISITES

While there are no formal prerequisites for this course, students are expected to be comfortable with:

- Linear algebra at the level of Math 387 (or equivalent)
- Real analysis at the level of Math 401 (or equivalent)
- Elementary programming
- Experience working with the terminal on Linux or MacOS is also highly recommended

LEARNING OUTCOMES

- Be able to develop modules for solving numerical problems in linear algebra, differential equations, and Monte Carlo
- Submit and retrieve jobs from the cluster
- Visualize and present numerical results

REQUIRED TEXTBOOK

An Introduction to Computational Stochastic PDEs, by Lord, Powell, and Shardlow.

We will cover portions of Chapter 1, 2, 3, 4, 5, and 8.

ASSIGNMENTS

- There will be two (2) assigned computer programming projects. Students may work together on these, but they are expected to hand in their own work.
- Students will also formulate, solve, and present their own final project. Students are allowed (and encouraged) to work in groups of up to two on the final project. Students must confer with the instructor and submit a brief outline of their intended project by the end of week six. Students will be expected to submit a written description and provide a 10-15 minute presentation during the last week of classes.

COURSE EVALUATION

- Assigned Projects: 50% (25% each)
- Final Project Outline: 10%
- Final Project: 40%

GRADING SCALE

Numeric Grade	Letter Grade	Numeric Grade	Letter Grade
97-100	A+	77-79	C+
93-96	A	73-76	C
90-92	A-	70-72	C-
87-89	B+	67-69	D+
83-86	B	60-66	D
80-82	B-	0-59	F

At the instructor's discretion, a curve may be applied.

COURSE POLICIES

ATTENDANCE

Students are expected to attend lecture and recitation, and they are responsible for all material covered in class along with all announcements given in class.

LATENESS

Late assignments and projects are subject to a 5% grade penalty for each lecture late.

PLAGIARISM/ACADEMIC HONESTY

Please check the following link for details <https://drexel.edu/provost/policies/academic-integrity/>

Students are permitted to work collaboratively on homework assignments in this course. Each student must submit individually.

For further information on Drexel University's academic integrity policies and resources, please consult the following university web pages:

- https://drexel.edu/studentlife/community_standards/code-of-conduct/academic-integrity-policy/
- https://drexel.edu/studentlife/community_standards/code-of-conduct/
- https://drexel.edu/studentlife/community_standards/faculty-academic-integrity-resources/

ADD, DROP AND WITHDRAWAL POLICIE

- You can **add** this course until the end of week 1, and you can also **drop** this course until the end of week 1, in which case the course will then be removed from your transcript.
- More information can be <https://drexel.edu/provost/policies/course-add-drop/>
- If you add this course after the start of the term, you are responsible for completing ALL work that you may have missed.
- The course **withdrawal** deadline is the Friday of week 7. You will have received some graded work prior to this deadline. If you have any questions about your progress at any time of the term, please contact instructor. If you choose to Withdraw, a "W" will be recorded in your transcript. <https://drexel.edu/drexelcentral/registration/courses/course-withdraw/>

DISABILITY ACCOMMODATIONS

It is the University's policy to provide a learning environment that provides all students with the opportunity to realize their full potential. To this end, the goal of the Office of Disability Resources ("ODR") is to assist students with disabilities in becoming self-sufficient, independent, and successful members of the University's community and to provide students with disabilities with equal opportunity of access to university courses, programs, facilities, services, and activities.

Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork Database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the website <https://drexel.edu/disability-resources/about/overview/>, or contact the ODR office by email disability@drexel.edu or by phone 215.895.1401

If you need additional tutoring or academic coaching services, please visit the website for Drexel's [Center for Learning and Academic Success Services \(CLASS\)](#).

MASK ETIQUETTE FOR THE 2021 FALL QUARTER

As of August 3, 2021, [Drexel requires all students and employees to wear a mask](#) in all on-campus public and shared spaces, including instructional and research settings, regardless of vaccination status. Specifically, masks are to be worn in classrooms, laboratories, lecture halls and seminar rooms. Students are not permitted to eat during class or otherwise remove their mask. If a student needs to remove their mask (to drink water etc.) they may step outside the class, to do so and then return to class. Please remember your mask to avoid class disruption.

If a student does not wear a mask or follow other required health and safety guidelines in the classroom, the instructor will take the following steps:

- Ask the student to please correct their behavior. This may involve determining if there is a reason why the student is unable to comply with the request; for instance, they may not have a mask. If a solution to the problem can be easily identified, and the instructor is able to assist the student in complying, such as directing them as to where to find a mask, they will do so.
- If the student refuses to mask, the instructor will inform the student that they will be referred to Student Conduct and they will be asked to leave the class.

As members of the Drexel community, we all play a role in supporting our collective health and safety, and I appreciate your collaboration and commitment to this. If you have questions or concerns about masking in class, please do not hesitate to ask. More information about masking is available at the link above and on the [Drexel Response to Coronavirus website](#).

COURSE SCHEDULE

This schedule is subject to change.

Week	Topics	NOTES
Week 1 (9/20)	Course intro, Julia/Jupyter Intro, solving the two-point boundary value problem (Sections 2.1, 1.1-1.3)	
Week 2 (9/27)	Boundary value problem continued, writing test units	
Week 3 (10/4)	Boundary value problem continued, FEM and Spectral Galerkin methods (Sections 2.2-2.3)	
Week 4 (10/11)	Time dependent problems (Sections 3.1, 3.4)	Columbus Day on Monday, Project 1 due 10/14
Week 5 (10/18)	Time dependent problems continued (Sections 3.2, 3.3, 3.5)	
Week 6 (10/25)	Fully discrete error analysis for time dependent problems (Sections 3.5-3.6)	Final Project Outline Due
Week 7 (11/1)	Introduction to random variables (4.1-4.2)	
Week 8 (11/8)	Convergence of random variables and intro to Monte Carlo (4.3-4.4)	Veterans Day on Thursday
Week 9 (11/15)	Random initial condition and random coefficient problems	Project 2 due 11/11
Week 10 (11/22)	Introduction to stochastic processes, Brownian motion (Sections 5.1, 8.1, 8.4)	Thanksgiving (No Class Thursday),
Week 11 (11/29)	Final Project Presentations	
Finals Week		