PHYSICS 3510

Physics, Computation and Software Applications

Spring 2026

Lecture Location/Time: Physics Building Rm. 116; MW, 1 pm – 2:20 pm

Instructor:	Jeremy Gingrich
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Office Hours:	Mondays, 2:30 pm – 3:30 pm; open to appointment

Course Description: This course introduces students to the use of computers in solving modern physics problems. Students will learn *computational thinking* and develop a flexible skillset, enabling them to explore and reinforce physical concepts, while understanding the role of computational physics in contemporary scientific research. A key component of the course will be the use of visualization techniques to better understand and communicate complex data and physical phenomena.

Students will explore various computational tools, including Python, Jupyter Notebooks, and GitHub, to work through physics problems and simulations. Students will learn strategies to troubleshoot errors and mistakes, an essential skill in both general computational work as well as all scientific endeavors. Emphasis will be placed on building reliable coding habits, especially practices that ensure code is well-documented, easily readable in the future, and preserved through proper version control practices.

By the end of the course, students will have the confidence and ability to use computers as tools for addressing and solving complex physical problems, removing barriers to computational approaches in their future studies and research.

Course Structure: In this course, learning will be structured with both pedagogical and active learning approaches. I anticipate that early in the course we will scaffold knowledge with chalkboard lectures and demonstrations, paired with short in-class activities and

homework, transitioning to more active learning components as we become more comfortable with key concepts and techniques.

Course Expectations and Classroom Climate: In this course, students are expected to actively participate in activities and assignments. Students are encouraged to bring physics problems that are of interest to them to class, as it allows for practical application of computational techniques and enables a deeper understanding of the material. Active participation in discussions, problem-solving sessions, and peer collaboration is essential for maximizing the learning experience.

Our class will be a respectful and supportive learning environment where new ideas, questions, and mistakes are welcome. All participants are expected to engage constructively, listen actively, and treat each other with respect and courtesy.

Recommended Textbook: While there is no required book for this course, many students may find access to a consolidated resource helpful. Here are several:

- *A Student's Guide to Python for Physics Modeling* by Jesse M. Kinder and Philip Nelson, Princeton University Press. ***This is the book that I will largely be following along during the course.***
- *Computational Physics* by Mark Newman, CreateSpace Independent Publishing
- *Python Crash Course: A Hands-on, Project-based Introduction to Programming* by Eric Matthes, No Starch Press.

Technology Requirements:

Minimum Technology Requirement:

- **Computational Resources:** Students must have access to a laptop or similar device with internet access, capable of running Python and associated libraries.
- **Software:** Python 3.x, Jupyter Notebooks, Git, GitHub, and a code editor (e.g., Vim). These tools will be introduced and set up during the early part of the class and will be used throughout the course.
- **Canvas:** Access to Canvas for course materials, assignments, and communications. Canvas will be used to post course materials, lecture notes,

announcements, grades, and the most up-to-date version of this syllabus (https://unt.instructure.com/). You may use your UNT EUID and password to log on and select this course.

- **GitHub Classroom:** Homework assignments and, often, in-class quizzes will be submitted through GitHub Classroom.

Computer Skills & Digital Literacy:

- **Basic Computer Literacy:** Students should be comfortable with fundamental computer operations, including file management, installing software, and navigating the internet.
- **Additional Skills:** Linux terminal usage, version control, and Python programming familiarity would be helpful, but is not a required prerequisite.

Grading: Course content may be evaluated for preparation, consolidation with previous course material, participation, and completion/correctness of assigned work.

Activities	Points	Example Evaluation Mechanism/Criteria
Preparation/Consolidation	20	Pre-class Assignments, Discussion, Quizzes
Participation	20	Attendance, Engagement, Peer Review, Dialogue
Assignment/Homework/Exams	60	Correctness, Presentation and Clarity, Creativity
Total	100	

Generative Artificial Intelligence (AI): At this point in time, the integration of AI into various workflows has become largely inescapable. As such, use of AI tools will be permitted in this course so long as they are used in the assistance of code writing and debugging, but not as a substitute. I will reserve the right to reassess this policy if I am made aware that these tools are being used as a substitute for basic skill development.

Academic Integrity Standards and Consequences: According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in

behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. The University Policy can be found at: https://vpaa.unt.edu/ss/integrity Links to an external site..

Course Evaluation – Student Perceptions of Teaching (SPOT): Student feedback is an essential part of participation in this course. Providing the student evaluation of instruction instrument is a requirement for all organized classes at UNT.

A short SPOT survey will be made available towards the end of the semester to provide you with an opportunity to evaluate how this course is taught. You will receive an email from *"UNT SPOT Course Evaluations via IASystem Notification"* (no-reply@iasystem.org) with the survey link. Simply click on the link and complete your survey.

Once you complete the survey, you will receive a confirmation email. For additional information, please email spot@unt.edu.

ADA Policy: The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the

Office of Disability Access website at https://studentaffairs.unt.edu/office-disability-access Links to an external site.. You may also contact ODA by phone at (940) 565-4323.

Emergency Notification & Procedures: UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Important Dates: **UNT Academic Calendar** Links to an external site.

Week	Dates	Day	
1	Jan 12 – Jan 14	MW	First week of class
2	Jan 19 – Jan 21	MW	
3	Jan 26 – Jan 28	MW	
4	Feb 2– Feb 4	MW	
5	Feb 9 – Feb 11	MW	
6	Feb 16 – Feb 18	MW	
7	Feb 23 – Feb 25	MW	
8	Mar 2 – Mar 4	MW	Semester midpoint, First exam
9	Mar 9 – Mar 11	MW	Spring Break
10	Mar 16 – Mar 18	MW	
11	Mar 23 – Mar 25	MW	
12	Mar 30 – Apr 1	MW	
13	Apr 6 – Apr 8	MW	Second Exam
14	Apr 13 – Apr 15	MW	
15	Apr 20 – Apr 22	MW	
16	Apr 27 – Apr 29	MW	Last week of regular class
17	May 4 – May 6	—	Final exams week