PHYSICS 3510

Physics, Computation and Software Applications

Fall 2025

Lecture, Language Building 323, TTh 9:30 am – 10:50 am

Instructor:	Guru Khalsa
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Office Hours:	Tuesdays, 11:00 am – 12:00 pm

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 understand 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 computational work and all scientific endeavors. Emphasis will be placed on building reliable coding habits, especially proactices 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. Bringing physics problems that you are interested in to class is highly encouraged, 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 should be a respectful, 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.
- *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): You are welcome to use generative AI tools (ChatGPT, Claude, etc.) in this course. These tools should be used as a supplement to your understanding, not a replacement. For example, these tools may help in the generation of code snippets for solving differential equations or linear algebra problems, or aid in plotting. *Note that for both physics and mathematics, these tools are often wrong, and often in subtle ways*. I suggest you scrutinize any information presented to you by these models and perform the necessary checks to ensure the information is correct. Ultimately, the assignments you submit and the information you present in this course will be attributed to you. *If you use AI tools, acknowledgment may be required for transparency.* If you are unsure, please ask me.

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.

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 Nov 11 - Dec 4 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. 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

Week	Dates	Day	
1	Aug 18 – Aug 20	TTh	First week of class
2	Aug 26 – Aug 28	TTh	
3	Sep 2 – Sep 4	TTh	
4	Sep 9 – Sep 11	TTh	
5	Sep 16 – Sep 18	TTh	
6	Sep 23 – Sep 25	TTh	
7	Sep 30 – Oct 2	TTh	
8	Oct 7 – Oct 9	TTh	Semester midpoint
9	Oct 14 – Oct 16	TTh	
10	Oct 21 – Oct 23	TTh	
11	Oct 28 – Oct 30	TTh	
12	Nov 4 – Nov 6	TTh	
13	Nov 11 – Nov 13	TTh	
14	Nov 18 – Nov 20	TTh	
15	Nov 25 – Nov 27	—	Thanksgiving Break
16	Dec 2 – Dec 4	TTh	Last week of regular class
17	Dec 9 – Dec 11	—	Final Exams Week