

# PHYSICS 4150: Experimental Physics I

Fall 2025

Lecture, Audb Room 201, TTh 2:00–3:20 p.m.

Laboratory, Physics Room 227, 002, 010 (mostly), MW 3:00 p.m–5:20 p.m.

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**Professor:** Duncan Weathers  
**Office:** Physics Bldg., Room 003  
**Telephone:** (940) 565-2079  
**E-mail:** [duncan.weathers@unt.edu](mailto:duncan.weathers@unt.edu)  
**Office Hours:** Th 3:30 - 4:30 p.m, and by appointment

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**Course materials:** Materials will be provided on Canvas. Students will be provided laboratory notebooks.

**Topics and General Information:** Students in this course will conduct a variety of experiments primarily in the areas of atomic, nuclear, and solid state physics, and radiation physics related to astrophysical processes. In the process students will learn about advanced laboratory instrumentation and techniques.

**Attendance:** Attendance of all lectures is strongly encouraged – background material and important details about each laboratory experiment will be presented in lecture. Laboratory attendance is required.

**Course structure:** Topics related to laboratory experiments will be covered in each week's lectures. Students will usually work in small groups on experiments, generally for one to two weeks per experiment. Students are expected to maintain a detailed laboratory notebook, which will be checked periodically by the instructor. Experimental results and any associated data analysis for each laboratory experiment must be completed and turned in one week after the lab is completed. For three of the experiments, a full written laboratory report must be submitted, following the general format below. The full written report is due two weeks after the lab is completed. At the end of the semester, each student will give a five-minute oral presentation over the results of one experiment of their choice. There will also be a written final exam to assess your understanding of the experiments.

**Grade:** The grading in the course will be based on the total points earned as follows:

Laboratory notebook	30%
Data analysis (10 labs)	25%
Laboratory reports (3 labs)	30%
Final presentation	5%
Final exam	10%
Total	<hr/> 100%

**Standard Laboratory Report Format** (due two weeks after lab experiment is completed):

I. Header or Cover Page

Student Name  
Course (Physics 4150)  
Date  
Lab Title (e.g., Optical Pumping)

II. Purpose – a succinct statement of experimental objectives and significance

III. Procedure – include a brief description of apparatus used, including schematic diagram or labelled picture(s), important instrument settings or experimental conditions, and summary of how measurements were performed

- IV. Results and Analysis – present data from measurements, in tabular and graphical form if appropriate; outline any calculations performed to manipulate experimental results or to make comparisons with models; include estimates of uncertainties where appropriate. **(This part must be done for all lab exercises, and is due one week after lab experiment is completed.)**
- V. Discussion and Conclusions – summary of findings, if experimental objectives were met, and how results compare with expectations (models)

Do not plagiarize - use your own words! This should be typeset using LaTeX (“the de facto standard for the communication and publication of scientific documents”), which is freely available; a good place to get started with it is <https://www.latex-project.org>.

### Potential Topics for Experiments:

Optical pumping  
Muon lifetime\*  
Nuclear magnetic resonance  
Superconducting quantum interference devices (SQUIDs)  
Rutherford scattering  
Compton scattering\*  
Bremsstrahlung\*  
Blackbody radiation/absorption spectroscopy\*  
X-ray fluorescence\*  
Carrier measurements in semiconductors  
Gamma-gamma coincidence from electron-positron annihilation\*  
Alpha particle energy loss in matter  
Neutron activation  
Chaotic behavior in a mechanical system  
Particle-induced nuclear reaction  
Photolithography  
  
(Mie scattering\*)

\*Astrophysical topic

*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 Accommodation (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 see the Office of Disability Accommodation website at [Office of Disability Access | University of North Texas](#). You may also contact them by phone at 940.565.4323.*

UNT’s policy on Academic Integrity can be found at: [Academic Integrity | University of North Texas](#).

Drop information is available at: [Fall Academic Calendar & Key Dates | University of North Texas](#).

The Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available to you on-line at the end of the semester and will provide you with an opportunity to provide feedback to your course instructor.