PH317: Experimental Physics

Course Name: Experimental Physics  Faculty: Janet Tate
Course Number: 317  Contact Info: Janet Tate
Course Credits: 3  Course Location: Corvallis
Meeting times: MWF 14:00-16:00

Course Catalog Description: Experimental physics: conducting experiments, understanding equipment, modeling physical phenomena, analyzing and presenting data, sources of variation and uncertainty. (Writing Intensive Curriculum, Departmental approval required.)
Prerequisites: PH213, PH315, PH335
Co-requisites none

Baccalaureate Core (BC) Syllabus Requirements:
- This course fulfills the Baccalaureate Core requirement for the Writing Intensive Curriculum category. Students write technical reports to communicate the concepts, procedure, results and analysis of two physics experiments.

Critical thinking
- Critical thinking skills related to the subject matter are incorporated into the instructional methods and acquired by students in the following ways:
  Students shall decide what models best represent the physical system and predict the outcome of the experiment. Students shall assess the quality, accuracy and precision of measurements and draw valid conclusions the experimental data. Statistical methods (mean, standard deviation) to quantify accuracy and precision are part of the curriculum. Regularly scheduled activities include team meetings where results from different groups are presented and compared.
- Critical thinking will be measured or assessed in the course in the following ways:
  Written reports contain sections that (i) describe the physical system and the underlying model, (ii) assess the quality, accuracy and precision of measurements and draw valid conclusions the experimental data. In-class presentations require that students assess the most important aspects of the work and defend its validity.

Baccalaureate Core learning outcomes (WIC)

1. Develop and articulate content knowledge and critical thinking in the discipline through frequent practice of informal and formal writing. (assessed by ungraded writing assignments, notebooks).
2. Demonstrate knowledge/understanding of audience expectations, genres, and conventions appropriate to communicating in the discipline. (assessed by technical report, oral presentation, peer review).
3. Demonstrate the ability to compose a document of at least 2000 words through multiple aspects of writing, including brainstorming, drafting, using sources appropriately, and revising comprehensively after receiving feedback.
Student Learning Outcomes:
1. Acquire new knowledge about physical phenomena (here, x-ray diffraction and Brownian motion) and use appropriate physical models to predict the results of experiments (assessed by technical report, presentations, quizzes).
2. Demonstrate technical and organizational skills by using, describing, and troubleshooting equipment and experimental procedures and by organizing collection, storage and evaluation of data (assessed by lab notebooks).
3. Analyze the quality, accuracy and precision of measurements and draw valid conclusions from the experimental data (assessed by lab notebooks, technical report, quizzes).
4. Participate in a scientific team, collaborate, assign and accept roles (assessed by individual reflections, technical report, peer review).
5. Provide peer review to team members (evaluate by peer review assignment)
6. Communicate scientific results and process (assessed by technical report, presentation, lab notebook).

Course Content: Outline of topics and/or activities with tentative scheduling and evaluation
- Week 1: Introduction to laboratory safety, laboratory techniques, sources of variation and simple random error analysis
- Weeks 2-4: X-ray diffraction, chemical analysis, (notebook evaluation, technical report draft)
- Weeks 5-7: Brownian motion, thermal physics, optical microscopy (notebook evaluation, technical report draft)
- Week 8-9.5: Advanced topics (notebook evaluation, final reports)
- Weeks 9.5-10: Presentations and evaluation

Evaluation of Student Performance:
Details of the tasks are in the "Assignments" section
- Lab notebook: 20%
- Technical report 1: 20%
- Technical report 2: 20%
- Peer review: 10%
- Quizzes, completion of ungraded assignments: 15%
- Presentation: 15%

Learning Resources:
Lab manual: PH317 Lab Manual, J. Tate (online, required),
or J. R. Taylor, An Introduction to Error Analysis: The Study of Uncertainties in
Reach Out for Success:
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at [oregonstate.edu/ReachOut](http://oregonstate.edu/ReachOut). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

Statement Regarding Students with Disabilities:
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Statement of Expectations for Student Conduct:
Students, TAs and Faculty are expected to abide by the highest ethical standards of the University and the profession. Please follow this link for details: [https://studentlife.oregonstate.edu/sites/studentlife.oregonstate.edu/files/code_of_student_conduct_final.pdf](https://studentlife.oregonstate.edu/sites/studentlife.oregonstate.edu/files/code_of_student_conduct_final.pdf)

Diversity Statement:
Oregon State University aspires to be a collaborative, inclusive and caring community that strives for equity and equal opportunity in everything we do; that creates a welcoming environment and enables success for people from all walks of life; and that shares common, fundamental values grounded in justice, civility and respect while looking to our diversity as a source of enrichment and strength. The College of Science and the Department of Physics are unwavering in their support of the University's interdependent principles of Inclusion, Equity, and Diversity.

Religious Holiday Statement:
Oregon State University strives to respect all religious practices. If you have religious holidays that are in conflict with any of the requirements of this class, please see me immediately so that we can make alternative arrangements.