# PHYS 290 (Spring 2022; 32996) Foundations Phys Lab

*(this document subject to change)*

| Instructor | Prof. Ben McMorran  
|------------|------------------|
|            | mcmorran@uoregon.edu  
|            | (mailto:mcmorran@uoregon.edu)  
|            | “he/him/his” pronouns  
| Office Hours (Zoom or use Chat in Canvas):  
|            | Tue 1100-1200 (after class ) or by appointment  
|            | WIL 174  
| Graduate Teaching Assistants | Trevor Brunnenmeyer <tbrunnen@uoregon.edu> (10:00 lab TA)  
|            | office hours: Th 12-1 PM, WIL 417 (Ampitheater outside of WIL 112 in good weather)  
|            | Tom Bouley <tbouley@uoregon.edu> (12:00 lab TA)  
|            | office hours: Fr 12-1 PM, Willamette Atrium  
| Course Dates | Spring term 2022, class meets March 29 - June 10, final lab report due Dead Week  
| Class Meetings | Class Meetings/Open Lab: Tuesdays 10:00 - 10:50  
|            | Labs Meetings: Various times on Thursdays  
| Website | All communication will be made through the course website on Canvas  
|            | https://canvas.uoregon.edu/courses/199528  
| Textbook | None required (any introductory university physics textbook, such as *Physics for Scientists and Engineers w/ Modern Physics 4th Ed.* by Randall Knight, suggested)  
| Co/Pre-Req | PHYS 253 and MATH 253 suggested  

## Overview

This course is designed to explore, in an experimental manner, the concepts presented in the Foundation in Physics I sequence (PHYS 251-253). This laboratory course is a separate class with
separate goals - exploring and learning electromagnetism experimentally. Students will develop physics experiments that they conduct outside of lab class, either using the lab room or at home using objects on hand, such as a smartphone, fridge magnet, balloons, or batteries and wire. Simulations may also be used to conduct experiments in virtual environments - no prior coding experience is required.

**Course Goals**

1. Learn how science is practiced, through both design but also trial and error, iterative discussion, and model-building.
2. Experimentally explore the basic principles of electricity, magnetism, and circuits.
3. Undertake investigation by inquiry, learn how to define unstructured problems.
4. Devise experiments to obtain quantitative data.
5. Gain experimental skills in error analysis, error propagation, and estimation.
6. Practice extracting data from graphs and instruments.
7. Gain a peek at what *real* research and development is like (e.g., interacting with others, designing experiments, analyzing data, communicating results).

**Course Structure and Activities**

- **Lab meetings (Thursdays)** will be conducted somewhat similar to scientific research group meetings on campus, where faculty, PhD students, and other researchers present and discuss their research updates with peers. With guidance from the graduate TA, who will adopt the role of a research advisor, students will design and conduct their own physics experiments. Students will be **expected to participate each week** by presenting (using professional visual aids like slides, posters, videos, or reports) summarizing their experimental activities in the prior week, present initial data, progress on developing theoretical models, data analysis, open questions, etc..

- **Class meetings (Tuesdays)** will be used as a flexible period to meet with the professor, conduct experiments in the lab, discuss modern experiments, or come together as a larger class to present results.

- Students will record **video demonstrations** of simple concepts covered in the main course (PHYS 253) such as electrostatics, magnetic interaction, Ohm's law, etc.. Sufficiently high quality video demonstrations will be invited to be presented at the Science of Energy Park at the Oregon Country Fair.

- The final products of the course include a **5-15 page report** and **video slide presentation** of a project or series of original experiments developed by the students over the term. These final reports must feature a quantitative data series, an error analysis of this data series, and extraction of some other physical quantity from these measurements.

**Course grade:**

Full participation in weekly lab meetings: 25%
Physics demonstration videos: 25%
Final written lab report: 25%
Final presentation: 25%

**Student Conduct:** Mutual respect in class is paramount. Interact with other students in a professional manner. Be continuously engaging and interacting with all members of your group. When working in groups, do not be either too passive or dominating. A major goal of this course is to train you on how to interact with others in a lab setting, not just learning physics.

**Academic dishonesty**, including cheating, fabrication, copying, facilitating academic dishonesty, and plagiarism**, devalues the reputation of our institution, its faculty, its students, and the degrees we offer. Moreover, academic misconduct is particularly unfair for the students who do their work with integrity and honor. Violations of the student conduct code result in the incident being included on your student conduct record and can result in a failing grade on any course work related to the violation or a failing grade in the course. Every effort will be made in this class to deter dishonesty through classroom procedures. Suspected academic dishonesty will be reported.

**For a list of other descriptions of cheating, see the Student Conduct Code ([http://uodos.uoregon.edu/StudentConductandCommunityStandards/StudentConductCode/tabid/69/Default.aspx](http://uodos.uoregon.edu/StudentConductandCommunityStandards/StudentConductCode/tabid/69/Default.aspx)).**

**Special Accommodations:** The AEC (Accessible Education Center) exists to help students achieve access to educational resources. If you have a disability but are not registered with AEC, you should contact them as soon as possible ([http://aec.uoregon.edu](http://aec.uoregon.edu)). If you anticipate needing special accommodation in Physics 290 please contact me as soon as possible so we may discuss your situation.

### Course Summary:

<table>
<thead>
<tr>
<th>Date</th>
<th>Details</th>
<th>Due</th>
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<tbody>
<tr>
<td>Thu Apr 1, 2021</td>
<td>📐 Electrostatic demonstrations</td>
<td>to do: 11:59pm</td>
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<tr>
<td>Wed Apr 7, 2021</td>
<td>🎨 Discussion of Electrostatic Demonstration Experiments</td>
<td>to do: 11:59pm</td>
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<tr>
<td>Wed Apr 6, 2022</td>
<td>🎨 Demonstration Video Assignment 1 - Electrostatics Demonstration (<a href="https://canvas.uoregon.edu/courses/199528/assignments/1273926">https://canvas.uoregon.edu/courses/199528/assignments/1273926</a>)</td>
<td>due by 11:59pm</td>
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<tr>
<td>Wed Apr 20, 2022</td>
<td><img src="https://canvas.uoregon.edu/courses/199528/assignments/1273927" alt="Demonstration Video" /> Assignment 2 - Electric Field or Gauss's Law Demonstration</td>
<td>due by 11:59pm</td>
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<td>Wed May 4, 2022</td>
<td><img src="https://canvas.uoregon.edu/courses/199528/assignments/1273928" alt="Demonstration Video" /> Assignment 3 - Electric Circuits Demonstration</td>
<td>due by 11:59pm</td>
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<td>Thu May 19, 2022</td>
<td><img src="https://canvas.uoregon.edu/courses/199528/assignments/1273929" alt="Demonstration Video" /> Assignment 4 - Magnetism</td>
<td>due by 11:59pm</td>
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<td>Thu Jun 2, 2022</td>
<td><img src="https://canvas.uoregon.edu/courses/199528/assignments/1273930" alt="Demonstration Video" /> Assignment 5 - Walkthrough of Final Lab Project</td>
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<td><img src="https://canvas.uoregon.edu/courses/199528/assignments/1273924" alt="Final Presentation" /></td>
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<td><img src="https://canvas.uoregon.edu/courses/199528/assignments/1273923" alt="Lab Report" /></td>
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