SYLLABUS
PHYSICS FOR LIFE SCIENCES II: Laboratory
PHYS-108L-04

Schmid College of Science and Technology
Chapman University
Fall 2020

Instructor: **Kristen Whitney, Ph.D. kwhitney@chapman.edu**
Office Location: Online via Zoom through Canvas
Zoom Meeting ID: 398 550 7196
Email: kwhitney@chapman.edu
Office Hours: Tuesday and Thursday, 3-4pm

Class Information: Lab: Wednesday 6:00 – 9:50 PM
Location: Online via Zoom through Canvas

Course Website: https://canvas.chapman.edu/

Textbooks:

Required: ***Lab Manual will be integrated into Canvas.***

Recommended Texts:

1. ***Physics for Scientists and Engineers: A Strategic Approach with Modern Physics (3rd Edition or 4th Edition) by Randall D. Knight,*** Publisher: Pearson (3rd ed. – 2012 or 4th ed. - 2016)
2. ***Free etextbook: University Physics Vol. 2 and Vol. 3 by Ling, S. J., et al,*** Publisher: OpenStax (2016). https://openstax.org/details/books/university-physics-volume-2

Optional Recommended Resources:

1. ***Schaum's Outline of Physics for Engineering and Science, 3rd Edition*** **by Michael Browne,** Publisher: McGraw-Hill; (2013)
2. www.khanacademy.org

Description

Explore the fundamentals of electromagnetism, the most prominent interaction in our daily life, with applications in the life sciences. From cellphones and computers to WiFi and medical imaging devices to biological replication and cognition, much of modern technology and life itself depends on electromagnetism. Investigate its principles and applications central to understanding biology (cell membrane, heart, nervous system, vision) and its applications in standard diagnostic and therapeutic tools and techniques used in medicine and the life sciences (MRI, X-rays, electrophoresis). Topics include static electric fields, static magnetic fields, electromagnetic forces, DC and AC circuits, Maxwell's equations, light, optics. This course includes a lecture and a required laboratory component held at different times. Lecture, laboratory. 4 credits.

Course and Lab Grade

The course is comprised of two main components: Lecture and Laboratory. The lab will be conducted synchronously via zoom through our lab course canvas. We will use theory to design experiments that test hypotheses. Learn to analyze experimental data, propagate error sources, and draw valid conclusions. The lab score is reported to the course instructor, who integrates it into the overall course assessments to generate a single grade for Physics 108. For more information concerning the contribution of lab to the course grade, please refer to the Physics 108 course syllabus.

Student Assessment and Lab Grade:

Assessment Category	Weight
Worksheets	15%
Lab Designs	25%
Lab Reports	50%
Individual Final Lab Presentation	10%

Lowest Lab Report or Lab Design Score Dropped and lowest worksheet score dropped.

Methods of Evaluation:

All documents (worksheets, lab designs, and lab reports) must be submitted to Canvas. The worksheets, lab designs, lab reports, and presentation will be graded directly on Canvas. Missed work will be automatically assigned a 0%. Late work will receive an automatic 10% reduction in grade per day.

The worksheets will be graded based on completion. Feedback will be provided to the design and the report of the experiments. Their scores will assess your ability to present theoretical and experimental ideas correctly, concisely, and with clarity.

In the last lab session of the semester, each student will be asked to give a short presentation on an experiment performed during the semester. The scientific ideas, as well as the quality of the oral presentation, will be reflected on the score assigned to it.

Instructional Methods/Strategies:

Beginning with lab 3 (in week 4), each lab will span two sessions (days) with the structure of the lab in each session following:

Session 1	Duration
Lecture	1h
Workshop	1h
Experiment design	2h

Session 2	Duration
Data analysis	2h
Report preparation	2h

Session 1 (Day 1): In the lecture portion of lab, an introduction to the topic of the experiment will be presented, reviewing the theory underlying the physical phenomena being investigated. Note that some topics will be covered in lab prior to your lecture section of the course, each topic thus investigated in lab will be self-contained but will reinforce the topics covered in the course lecture. Following an overview of the topic will be an hour problem-solving workshop where a worksheet consisting of problems associated with the topic of the experiment will be solved by lab groups in zoom breakout rooms followed by a class discussion of the solution to each problem. In the final 2 hours of lab, each lab group will prepare the design of the experiment. A written design of the experiment will be submitted by each group to canvas. The design will consist of the hypothesis and a detailed set of procedures to test the hypothesis. The instructor will subsequently summarize 3 experimental approaches submitted and provide a poll for the class to vote on in regards to the best experimental design to conduct. The instructor will perform the experiment chosen before the next lab meeting and the data will be relayed to the class for lab groups to analyze in the next lab session.

Session 2 (Day 2): Each group will analyze the data in breakout rooms via zoom followed by conducting error analysis and a reassessment of experimental design. Once completed, students can start preparing their report. Lab reports are due at the beginning of the following week's lab session in the following formats:

- ***Title***
- ***Abstract***
- ***Introduction***
- ***Procedure***
- ***Analysis***
- ***Conclusion***

Lab Schedule

Week	Lab #	Topic
1 (8/31)	1	Electrostatics
2 (9/7)	1	Electrostatics
3 (9/14)	2	Mapping Electric Fields and Potentials
4 (9/21)	3	DC Circuits I: Ohm's Law, Resistors in Series and Parallel
5 (9/28)	3	DC Circuits I: Ohm's Law, Resistors in Series and Parallel
6 (10/5)	4	DC Circuits II: Resistors in Multiloop Circuits
7 (10/12)	4	DC Circuits II: Resistors in Multiloop Circuits
8 (10/19)	5	DC Circuits III: RC Circuits
9 (10/26)	5	DC Circuits III: RC Circuits
10 (11/2)	6	Magnetic Fields: Straight Wire/Permanent Magnet/Coil

11 (11/9)	6	Magnetic Fields: Straight Wire/Permanent Magnet/Coil
12 (11/16)	7	Faraday's Law: Moving Magnet/AC Source
13 (11/23)		Thanksgiving Break
14 (11/30)	7	Faraday's Law: Moving Magnet/AC Source
15 (12/7)	-	Individual Presentations
16 (12/14)		**Finals Week**

Remote Instruction - Recording

In this class, software will be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded to assist those who cannot attend the live session, or to serve as a resource for those who would like to review content that was presented. These recordings will be made available only to students who are enrolled in the class, and only during the period in which the course is offered. All recordings will become unavailable to students in the class shortly after the course ends. Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Please discuss this option with your instructor.

Lab Safety

On campus safety protocols: students are required to follow all safety rules and standards set forth by Schmid College of Science and Technology. Students not following these standards may be asked to cease activities and/or leave the laboratory. Laboratory instructors have full discretion to assess penalties as they see fit should students violate any of these policies. Furthermore, **students are required to wear close-toed shoes and pants**, where appropriate eye protection will be provided as needed to participate in lab activities. Students will be asked to leave lab and marked absent if not appropriately attired.

Course Learning Outcomes

1. Employ basic laboratory skills to collect data.
2. Measure, collect, record, and analyze experimental data using reasonable statistical methods to estimate the associated uncertainties in the data and calculate quantities.
3. Implement, analyze & evaluate experiments and the resulting data, demonstrating a broad range of physical laws and principles.
4. Clearly report on experimental work, using written descriptions, diagrams, tables, graphs, formulas, and calculations.
5. Become proficient in setting up, using, adjusting and calibrating complex scientific equipment and physics laboratory tools to conduct experiments, using instructions, technical diagrams, manuals, and instructor assistance.
6. Demonstrate an understanding of relationship of key principles in physics to the experimental observations and results.
7. Utilize laboratory experiments and hands on experience to reinforce, elucidate, and verify abstract theoretical concepts and laws learned in lecture, in order to master a broad set of physical principles that form the basis of a fundamental branch of physics, classical electromagnetism.

Physics Program Learning Outcomes

Upon graduation:

1. Students will recall and use mathematics to precisely formulate and solve physical problems.
2. Students will recall and use core principles of classical mechanics, electromagnetism, quantum mechanics, thermal physics, and statistical mechanics to model and analyze a variety of physical phenomena.
3. Students will use both laboratory and computational skills to take measurements, numerically simulate physical models, and analyze data to draw valid conclusions.
4. Students will effectively communicate scientific results to both technical and general audiences.
5. Students will demonstrate that they can think critically and work both independently and in collaborative teams.

General Education - Natural Science Inquiry Learning Outcome:

Students engage in scientific investigation to explore the knowledge produced by scientific processes.

Academic Integrity

Chapman University is a community of scholars that emphasizes the mutual responsibility of all members to seek knowledge honestly and in good faith. Students are responsible for doing their own work and academic dishonesty of any kind will be subject to sanction by the instructor/administrator and referral to the university Academic Integrity Committee, which may impose additional sanctions including expulsion. Please see the full description of Chapman University's policy on Academic Integrity at www.chapman.edu/academics/academicintegrity/index.aspx.

Accommodation for Students with Disabilities

In compliance with ADA guidelines, students who have any condition, either permanent or temporary, that might affect their ability to perform in this class are encouraged to contact the Disability Services Office. If you will need to utilize your approved accommodations in this class, please follow the proper notification procedure for informing your professor(s). This notification process must occur more than a week before any accommodation can be utilized. Please contact Disability Services at (714) 516–4520 or visit www.chapman.edu/students/student-health-services/disability-services if you have questions regarding this procedure or for information or to make an appointment to discuss and/or request potential accommodations based on documentation of your disability. Once formal approval of your need for an accommodation has been granted, you are encouraged to talk with your professor(s) about your accommodation options. The granting of any accommodation will not be retroactive and cannot jeopardize the academic standards or integrity of the course.

Equity and Diversity

Chapman University is committed to ensuring equality and valuing diversity. Students and professors are reminded to show respect at all times as outlined in Chapman's Harassment and Discrimination Policy. Please see the full description of this policy at http://www.chapman.edu/faculty-staff/human-resources/eoo.aspx. Any violations of this policy

should be discussed with the professor, the dean of students and/or otherwise reported in accordance with this policy.

Student Support at Chapman University

Over the course of the semester, you may experience a range of challenges that interfere with your learning, such as problems with friend, family, and or significant other relationships; substance use; concerns about personal adequacy; feeling overwhelmed; or feeling sad or anxious without knowing why. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. You can learn more about the resources available through Chapman University's Student Psychological Counseling Services here:
https://www.chapman.edu/students/health-and-safety/psychological-counseling/

Fostering a community of care that supports the success of students is essential to the values of Chapman University. Occasionally, you may come across a student whose personal behavior concerns or worries you, either for the student's well-being or yours. In these instances, you are encouraged to contact the Chapman University Student Concern Intervention Team who can respond to these concerns and offer assistance:
https://www.chapman.edu/students/health-and-safety/student-concern/index.aspx

While it is preferred that you include your contact information so this team can follow up with you, you can submit a report anonymously. 24-hour emergency help is also available through Public Safety at 714-997-6763.