PHYSICS 220BL - Electricity & Magnetism Laboratory Syllabus

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Office: LO1104, Office Hours: Tues 12-2pm (through zoom)

Course Description: This course is the second in the Physics 220 series of laboratory practices. This laboratory covers electricity, magnetism and basic circuits, both DC (Direct Current) and AC (Alternating Current). The students should consult their PHYS 220B or 226 textbook for matters dealing with theory. Note: The course is designed to be independent of the lecture courses PHYS 220B and PHYS 226.
Course Objective: To understand the role of experiments in the scientific method and how errors in measurements affect the results. To be able to analyze data.
General Education Requirements: This course, together with PHYS 220A, fulfills the Subject Exploration: Natural Sciences requirements of General Education. This course satisfies the following GE Student Learning Objectives (SLOs):

SLO 1: Demonstrate an understanding of basic knowledge, principles, & laws in the natural sciences.
SLO 2: Explain how the scientific method is used to obtain new data and advance knowledge.
SLO 3: Demonstrate an understanding of the logical foundations and boundaries of science.
SLO 5: Demonstrate competence in applying the methods of scientific inquiry.

The course SLOs are met by learning the role that errors play in measurement including how to measure these errors, and how they affect the results via propagation of errors. Understanding the importance of recording the conditions of the experiment, how the measurements were done, and what the measurements were. Learning how to analyze the data collected and using the results to prove or disprove a conjecture/theory. Understanding the role that experimentation plays in verifying the laws of nature and the significance of the scientific method.

Covid-19 safety protocols:

CSUN is permitted by LACDPH to hold on-campus classes on the condition that everyone adheres to the following protocols:

(a) Complete a health self-screening survey through the CSUN app before coming to campus and follow corresponding instructions.
(b) Monitor your health. Take your temperature once a day. If you have a fever of 100.4 or other symptoms of COVID, or are just feeling ill, call your doctor or the Klotz Student Health Center at 818-677-3666.
(c) Please do not come to campus if you feel sick.
(d) When on campus, please adhere to the following:
    1. Maintain at least six (6) feet distance from others
    2. Wear a face covering
    3. Wash hands frequently with soap and water for at least 20 seconds
    4. Avoid touching eyes, nose, and face
    5. Follow university signage on walkway paths and distancing markers for lines

For more information, visit the CSUN as One webpage at csun.edu/csunasone.

Equipment required:

Items 1-3 may be a single device, of course, but it does not necessarily need to be.

1. Computer with internet access and a working installation of Matlab (CSUN has a campus license) or GNU octave (Free: http://octave.org). A working printer is recommended.
2. Device to take pictures with to upload work, *e.g.* cell phone or tablet. The CSUN Library has a loan program if you do not have access to one.
3. Device with camera and internet connection for zoom video conferencing with fellow students and instructor and headphones. You will need to bring this device with you when you are scheduled to do the in person lab.

Course Schedule:

Due to Covid related space occupancy limitations, this lab is run as follows.

1. The lab section consists of 4 cohorts of maximum 8 students. You are assigned a cohort number in week 1.

2. You will have **2 in person labs** in the entire semester. The rest of the labs will be online, synchronously.
3. There are two types of online labs:
    1. **Virtual**: You work based on the prompts provided by your TA on assignments.
    2. **Lab kit**: You will receive an electronics kit that will enable you to do an experiment completely by yourself, at home.
4. We will pivot from virtual labs to kit labs a few weeks into the semester (TBA), when all kits have been distributed. At that point, the lab schedule will change. You will be notified at least a week in advance what lab will be run the next week and you will receive PDFs of new instructions. However, the in person schedule below will not be changed.

The lab numbers are listed below for the 4 cohorts. Note that labs 10 and 11 are at CSUN, from the printed manual.

Week count	Date	Cohort 1	Cohort 2	Cohort 3	Cohort 4
1	01/26/21	0	0	0	0
2	02/02/21	1	1	1	1
3	02/09/21	2	2	2	2
4	02/16/21	3	3	3	3
5	02/23/21	4	4	4	4
6	03/02/21	5	5	5	5
7	03/09/21	10 @ CSUN	6	6	6
8	03/16/21	Spring Break			
9	03/23/21	6	10 @ CSUN	7	7
10	03/30/21	Skip week (Cesar Chavez)			
11	04/06/21	7	7	10 @ CSUN	8
12	04/13/21	8	8	8	10 @ CSUN
13	04/20/21	11 @ CSUN	9	9	9
14	04/27/21	9	11 @ CSUN	12	12
15	05/04/21	12	12	11 @ CSUN	13
16	05/11/21	13	13	13	11 @ CSUN

Course Requirements and Methods of Evaluation:

1. Attendance and participation are **MANDATORY**. As per University Attendance Policy, students who miss the first week of class will lose the right to remain in the class and must **FORMALLY WITHDRAW** from the course themselves. Failure to do so, will result in a **WU (= "F" in GPA calculation)** grade for the course.

2. Any **unexcused missed** labs after the first week will result in a score of **zero** for these labs. If excused, students are required to make it up in another lab.

3. Printed lab manual - **Physics 220BL Laboratory. Read** the lab manual for the next experiment thoroughly before the lab. **The correct version is Oct 17, 2020**. If you have an old version, you are required **to check for changes** against one of your classmates' copy. Buy yourself a dedicated 3-ring lab binder to keep notes & labs in.

4. Online lab manuals are different from the printed manual ones. You will receive the instructions and reading material for these labs through canvas, at least a week before the lab.

5. Online data taking: Online labs have various checkpoints that help you determine whether things are working correctly for you or not. **Do not proceed** until things work correctly, otherwise you will not get the 20 points for the data sheet portion.

6. In person lab data taking: Take data directly using a pen, NOT a pencil. After you have obtained the experiment's data, you may leave and complete any required calculations (that are not prerequisites for further parts of the same lab) outside of the lab. **For in person labs: have your instructor initial your data before leaving the lab. You should attach this signed data to your report. For online labs: submit your datasheet through canvas before the end of class. On time submission is considered a signature by the instructor.**

7. Each lab is graded on a 45 point basis (except lab 0, which is 15 points) and shall consist of:

(a) 20 points : Performing all measurements correctly and the data sheet(s)

(b) 20 points : Data analysis including completed calculations, error analysis and graphs

(c) 5 points : Answers to questions

8.Your lab report is due at the beginning of the next lab, submitted through canvas. Your report consists of

1. data sheet(s) with instructor initials (in person) or submitted through canvas at end of class in which the data was taken
2. analysis that was asked for (plots, calculations, source of Matlab/Octave analysis, etc),
3. (for fully online labs) pictures of the experimental setup with sufficient detail to confirm correctness
4. answers to questions.

   Everyone must turn in their own report, even if you were working in teams. For grading purposes, your final report for the previous week's experiment must be turned in at the beginning of the next class. (Late reports turned in within 24 hours of the due date will lose 5 points from their total. No reports shall be accepted after that.) The report for the last lab is due one week after the last lab.

8. If your lab report contains any **of the common mistakes** made by students in the past, you will have an opportunity to fix those mistakes after the deadline, but within one week. It will not be graded until you fix these mistakes.

9. You must be punctual. If you are late, there will be penalties:

(e) Being late to lab (up to 15 min) lose 5 pts

(f) (15 to 30 min) lose 10 pts

(g) Do not show up if you are going to be more than 30 minutes late. It constitutes a missed lab.

10. If you have a question, ask your instructor. However, keep in mind that you will benefit from the lab in direct proportion to your efforts to think through problems and to solve them, hence try to solve it first.

11. Email policy: although you may receive a response before that, I am committed to responding to your emails within 36h, +24h per weekend day/holiday. Plan accordingly.

12. Grading Criteria:

The maximum score from the labs is 600 points. grades will be based on the following:

A : 600 - 555
A- : 554 - 539
B+ : 538 - 523
B : 522 - 495
B- : 494 - 479
C+ : 478 - 463
C : 462 - 435
C- : 434 - 419
D+ : 418 - 403
D : 402 - 375
D- : 374 - 359
F : 358 - 0

13. Be safe and courteous. Unsafe and disruptive behavior will cause points to be deducted.

14. This is a 2.5 hr lab. Please do not expect to be here for less time. It is in your best interest to take your time, do the experiment well, and write up what you can before you leave.