

Physics 276 Syllabus - Spring 2020

Professor Fred Wellstood

Official Course Description:

PHYS276: Experimental Physics II: Electricity and Magnetism, Credits: 2, Permission Required, Prerequisite: PHYS272 and PHYS275. Second course in the 2 semester introductory lab sequence. Methods and rationale of experimental physics. Experiments chosen from the fields of electricity and magnetism including electrostatics, magnetostatics, magnetic induction, AC circuits.

Web Site: To get the latest information on Physics 276, check ELMS Canvas or:

<http://www.physics.umd.edu/courses/Phys276/index.html>

***Course Instructors:** You can try stopping by our offices at any time, but if you can't find us, make an appointment by e-mail.

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*** Prerequisites:** The prerequisites for the course are Physics 272 and Physics 275.

*** Grading:**

- 15% Prelab Homework
- 30% Preliminary Spreadsheet Report with data, submitted at end of each lab
- 25% Formal Lab Reports
- 10% Class Presentation
- 20% Practical Exam

Note 1: All experiments must be completed to pass the course.

Note 2: If you are looking at your grades on ELMS, it will have columns that claim to be your “Total” score in the course. Unfortunately, these “Total” scores are wrong because they do not include your prelab scores and are typically not weighted correctly. Thus **the numbers that ELMS automatically generates in its “Total” columns are not your correct, current, or official final scores.** Unlike ELMS, you can always check your final score by using the above weighting and the scores for individual assignments posted on ELMS and Expert TA. At the end of the semester, the instructor generates a correctly weighted final score, as specified in the syllabus, and this is what is used for assigning your grade.

Note: Final grades will be computed based upon the above weightings. Based on your official total score, standard grading will be followed (**A+** 97–100%, **A** 93–96%, **A–** 90–92%, **B+** 87–89%, **B** 83–86%, **B–** 80–82%, **C+** 77–79%, **C** 73–76%, **C–** 70–72%, **D+** 67–69%, **D** 63–66%, **F** below 63%) with the weighting given above, unless the class's distribution of scores is highly unusual, in which case a curve will be used. All Experiments must be completed to pass the course. No scores for experiments, reports, presentations, pre-lab questions, exams or any other assignment will be “dropped”.

What the course is about:

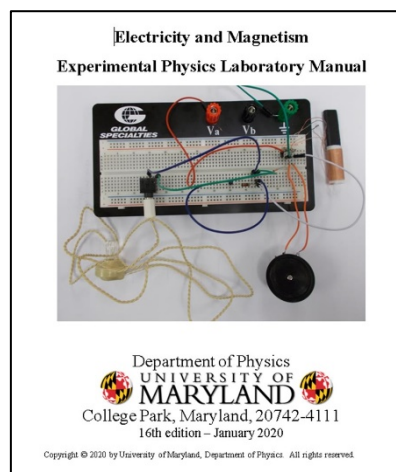
Physics 276 is the second course in the introductory Physics lab sequence Phys 275-276. The course is intended for physics majors and also for science and engineering students who desire a more rigorous introduction to experimental science. Experiments are mainly chosen in the general area of ac and dc circuits, and electricity and magnetism. Other major components of the course include the construction of an AM radio, analysis of both random and systematic errors, working individually and with a lab partner, and writing clear professional lab reports.

The Lab meets for four hours each week in **Room 3120** of the Physics Building. During this time you will be continually discussing with your instructors and other students as you work through each experiment. Each student will be provided with a kit that includes electrical components, a breadboard or two, and a complete set of parts needed for constructing various circuits and AM radios. We have extra components, but please be careful not to break or lose them. You will be provided with a yellow storage bin for your components and circuits that you built and will need for later experiments.

For general University policies on course syllabi, consult the Office of Undergraduate Studies Course Policies site: <http://www.ugst.umd.edu/courserelatedpolicies.html>.

* Required Texts:

- (1) "*Electricity and Magnetism Experimental Physics Laboratory Manual*" – 16th Edition- Spring 2020. This Lab Manual and access to the PreLab Questions for PHYS276 are only available electronically from the online service Expert TA. Older editions differ significantly and cannot be used. In order to purchase the lab manual from Expert TA, follow the steps listed below in the Expert TA section. If the University Bookstore incorrectly lists "no textbook required" for the course, don't be fooled - you need to purchase electronic access to the lab manual and Prelab questions by going to Expert TA.
- (2) "*A Practical Guide to Data Analysis for Physical Science Students*" by Louis Lyons.



Purchasing the Lab Manual from Expert TA and getting access to the Prelab Questions:

1. Locate your section number in the table below and then find the Expert TA registration link for your specific section.
2. Double check that you have the correct section and the correct link (Thurs is 301).
3. Click on the link for your section and follow the instructions for purchasing access.

Lab sections (all sections meet in Room 3120 Physics)

section	Day	Time	Expert TA registration link	Instructor	TA
0101	Mon	1-4:50 PM	you must get this registration link from Prof. Ouyang if you are in this section	M. Ouyang	Brandon Johnson
0201	Tue	1-4:50 PM	you must get this registration link from Prof. Ouyang if you are in this section	M. Ouyang	Nathaniel Barbour
0301	Thur	2-5:50 PM	http://goeta.link/USH22MD-99B238-1XO only use this link if you are in Thurs. 0301 section	F. Wellstood	Nathaniel Barbour
0401	Wed	2-5:50 PM	http://goeta.link/USH22MD-664BD7-1XN only use this link if you are in Wed. 0401 section	F. Wellstood	Brandon Johnson

*** Recommended Texts:**

- (1) "Introduction to Error Analysis" by John R. Taylor.
- (2) "Data Reduction and Error Analysis for the Physical Sciences", by P. R. Bevington.
- (3) "The Art of Electronics", Paul Horowitz and Winfield Hill.
- (4) "Engineer's Notebook II", Forest M. Mims III
- (5) "Radio Engineering", Frederick Emmons Terman.
- (6) "Schaum's outline series: Theory and Problems in Basic Electrical Engineering", J. J. Cathey and S. A. Nasar.
- (7) "Volume II: The PN Junction Diode" and "Volume III: The Bipolar Junction Transistor", G. W. Neudeck, Modular Series on Solid State Devices.
- (8) "Electromagnetic Fields and Waves", Lorrain and Corson.
- (9) The web has many sites on amateur radios. See for example <http://www.crystalradio.net/>

***The Prelab Questions:** Prelab Questions are due just before your lab section starts and the Prelab homework is a significant part of your grade. The labs typically require circuit assembly and troubleshooting as well as data taking, analysis, problem-solving skills and considerable thought. Four hours may seem like plenty of time, but to finish on time, you must prepare before you get to the lab. It is essential that you read through the lab write-up and complete the Prelab Questions before you get to the lab. The answers to all the Prelab Questions can be found by reading the lab write-up. To get credit for completing the Prelab Questions, you must log onto the Expert TA website and complete the assignment before it is due. No paper submissions can be accepted - you must submit via Expert TA. Answering and submitting the assignment in Expert TA before your section starts is the only way to get credit for the Prelab Questions.

***Your Preliminary Spreadsheet Lab Report** - Each week, before you leave the lab, you must submit to ELMS Canvas an Excel spreadsheet lab report of all the work you completed so far. This ensures that your instructors have a record that you did the lab and also preserves a copy of your work in a safe and secure place where both you and your instructor can always get a copy. The spreadsheet lab reports are a significant part of your grade.

***Formal Lab Reports:** You are required to submit a written report of your results for a few of the experiments (see the schedule). The reports will be submitted electronically to ELMS Canvas and will be due as set by the schedule. Your lab report should be submitted as an MS Word file, complete with data and figures. The format and requirements for the Lab reports are given in the introduction section in the Physics 276 lab manual and there is additional advice below.

***Late Reports:** Late lab reports will be assessed a penalty of 10% (10 points out of 100) per day. A missing lab report would typically cost about one letter grade for the course. Missing a lab entirely, and not making it up, will result in failure in the course.

***Presentations:** During the week of **March 23-26** (Experiment #8), each student will give a 10 to 15 minute Power-point presentation to the class on some aspect of circuits or radio technology. Specific topics will be chosen two weeks earlier from a list of suggested topics in consultation with your instructor. Your slides must be uploaded on ELMS Canvas by the start of the lab (just like Prelab homework). Topics are chosen first come, first serve, so you will want to pick a topic early for the best selection. If you would like to practice your presentation the week before, let your instructor know and you can try to arrange a suitable time. Your presentation will count significantly towards your overall grade in the course.

***Practical exam:** The practical exam will be given at the end of the semester based on material covered during the semester. Students are expected to take data following appropriate experimental procedures and explain the underlying physics. Knowledge of the workings of the instruments used in the lab may also be tested. The exam is closed notes, closed book, and the use of Google or any other external resource during the exam is expressly forbidden.

Tips for Doing Well:

- (1) Don't forget to do the Pre-lab Homework **before** each lab.
- (2) Read the lab manual carefully **before** you go to the lab and attempt an experiment.
- (3) During class, keep a record in your lab notebook of the experiment including diagrams of measurement configurations actually used to obtain data, your results, and the analysis used to obtain the results.
- (4) Use your spreadsheet to record, plot and analyze your data **in class as you collect it**.
- (5) Include estimates for the uncertainties in your measurements. Include systematic errors as well as statistical errors.
- (6) When something in the lab isn't making sense or isn't working raise your hand and discuss with your instructor.
- (7) Do not leave class unless you have finished your data analysis, discussed your results with your instructor and turned in your spreadsheet.
- (8) Never leave the lab without first submitting your preliminary spreadsheet
- (9) Do not forget to turn in your complete Formal lab report for a lab that requires one - formal lab reports are typically due by the start of the next lab.

Academic Integrity - The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit:

<http://www.studenthonorcouncil.umd.edu/whatis.html>.

In particular it is never permissible to submit someone else's work as your own - you need to prepare your own lab report, you cannot let anyone else submit your report as their own or as a joint report, and you cannot submit someone else's report as your own.

General Comments on Lab Reports and Homework:

Finishing all the lab reports and homework and turning them in on time is very important. If you can't completely finish a lab or lab report, it is still important to turn in what you do have by the due date. When you are working on your report or homework, feel free to discuss with other students to try to figure out what is going on. However, do not use these discussions as an excuse to copy someone else's report or solution, or let someone else copy yours. That is cheating and is strictly forbidden. It is also very self-defeating since a large part of your grade (50%) will come from tests. The right way to proceed is first to work through the report and arrive at a definite answer on your own. With this preparation you can then discuss intelligently with your colleagues and see if you have missed something essential. Of course, you can always ask your instructors!

In case of Bad weather: Fall in the Washington metro area can bring storms, including Hurricanes that make travel difficult and dangerous. If the University is closed during a scheduled lab, class will be cancelled, and we will most likely reschedule the lab for the following week. Closing is announced over local radio and TV as well as on the University's homepage.

For the University's general policies on courses see
<http://www.ugst.umd.edu/courserelatedpolicies.html>

Important dates for Physics 276

(Preliminary schedule as of January 10, 2020)

Jan 27 (Mon.)	First day of classes. Labs meeting and 1-st Prelab assignment due
Jan 27 – Jan 30	Exp #1 – DC Circuits, Ohm's Law and Multimeters
Feb 3 – Feb 6	Exp #2 – Digital Oscilloscope, AC Signals and Function Generators
Feb 10 – Feb 13	Exp #3 – Diodes and Rectification (<u>Formal Lab report required</u>)
Feb 17 – Feb 20	Exp #4 – Capacitors and RC Circuits (<u>Formal lab report due for Exp #3</u>)
Feb 24 – Feb 27	Exp #5 – Magnetic Fields and Inductance
Mar 2 – Mar 5	Exp #6 – AC Circuits, Impedance and Filters (choose presentation topic)
Mar 9 – Mar 12	Exp #7 – LRC Circuit and Resonance (choose presentation topic)
Mar 16 – Mar 19	<i>Spring break - no labs</i>
Mar 23 – Mar 26	Exp #8 – Student presentations- 15 minutes each
Mar 30 – Apr 2	Exp #9 – Tuned Crystal Radio
Apr 6 – Apr 9	Exp #10 – The Transistor (<u>Formal Lab report required</u>)
Apr 13 – Apr 16	Exp #11 – AM Transistor Radio (<u>Formal lab report due for Exp #10</u>)
Apr 20 – Apr 23	Exp #12 – Opamp and Multiplier
Apr 27 – Apr 30	Exp #13 – Review for the Practical Exam
May 4 – May 7	Exp #14 – Practical Exam
May 11 – May 14	<i>No Labs (last 2 days of semester and start of final exam week)</i>
May 12 (Tue)	<i>Last Day of Classes</i>
May 13 (Wed)	<i>Reading Day</i>
May 14-20	<i>Final Exams Week</i>