

## Physics 276 Syllabus - Fall 2016

### 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 three semester introductory 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.

#### **Prof. Fred Wellstood**

e-mail: well@squid.umd.edu

Office: Room 0367 Physics Building

Phone: 301-405-7649

#### **Prof. Vladimir Manucharyan**

e-mail: manuchar@umd.edu

Office: 2156 Physical Sciences Complex

Phone: 301-314-2159

#### **\* Teaching Assistants**

TBA

TBA

#### **e-mail:**

#### **office:**

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

#### **What the course is about:**

Physics 276 is the third course in the introductory Physics lab sequence PHYS 174-275-276. 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 lab reports.

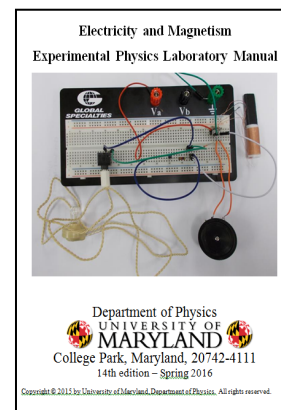
The Lab meets for four hours each week in **Room 3120** of the Physics Building. You should expect that roughly three hours of this time will be spent working on the lab and one hour in discussion with your instructors and other students during the lab.

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 extras of some of the components, but please be careful not to break or lose them. You will be provided with a yellow storage bin for your components and works in progress.

**\* Required Texts:**

(1) "*Electricity and Magnetism Experimental Physics Laboratory Manual*" – 14<sup>th</sup> Edition- Spring 2016. This Lab Manual and access to the PreLab Questions for PHYS276 are only available electronically from the online service Expert TA. 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 **class code** for your specific section. Make sure you have the correct section and the correct code.
2. Go to <https://www.theexpertta.com/registration/>
3. Follow the instructions... be sure to enter the correct class code for your section listed below.

**Lab sections:**

section	Day	Time	class code	Instructors	Teaching Assistant	Lab Room
0101	Mon.	2-5:50 PM	USH22MD-3FDD04-1FP	V. Manucharyan	TBA	3120 Phys
0201	Tue.	2-5:50 PM	USH22MD-5D4FC0-1FU	F. Wellstood	TBA	3120 Phys
0301	Thur.	2-5:50 PM	USH22MD-145562-1FT	F. Wellstood	TBA	3120 Phys
0401	Wed.	2-5:50 PM	USH22MD-A89774-1FO	V. Manucharyan	TBA	3120 Phys

**\* 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*", Gerold W. Neudeck, Modular Series on Solid State Devices.
- (8) "*Volume III: The Bipolar Junction Transistor*", Gerold W. Neudeck, Modular Series on Solid State Devices.
- (9) "*Electromagnetic Fields and Waves*", Lorrain and Corson.
- (10) There is a fair amount of web-based content on amateur radios, see for example <http://www.mds975.co.uk/Content/crystalsets2.html>. This website on crystal radios was put together by Felix Sceri and it has many designs and photos of working radios.

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

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

**Note:** “Total” scores listed on ELMS typically leave out prelab scores and are NOT weighted as given above. Thus “Total” scores on ELMS are not your correct, current, or official final score. In other words your scores on each lab will be listed correctly on ELMS, but the total scores or percentages listed on ELMS are completely bogus. Your instructor will generate a correctly weighted final score at the end of the semester and this is what is used for assigning your grade.

**Note: Final grades will be computed based upon the above weightings.** Standard grading will be followed (A is 90-100, B is 80-90, etc.) unless the class's distribution of scores is highly unusual, in which case a standard curve will be used.

**\*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 and thought. Four hours may seem like plenty of time, but to finish in this limited time, you have to prepare before you get to the lab. In particular, it is essential that you read through the lab write-up and complete the Prelab Questions before you get to the lab. It should not surprise you that the answers to all the Prelab Questions can be found by reading the lab. To actually complete the Prelab Questions and get credit for them, you must log onto the Expert TA website and complete the assignment. 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 is to ensure that your instructor has a record that you did the lab and also that there will be 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 several of the experiments (see the schedule). The reports will be submitted electronically to Blackboard Canvas and will be due at the start of lab the following week. 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 some 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 October 17 (see updated schedule for possible time changes), each student will give a 10 to 15 minute Power-point presentation to the class on some aspect of 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!

**One final thing** - If you miss something fundamental in a lab or test, you may be assigned extra problems to solve until you master the concept.

**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](#).

## **Important dates for Physics 276** (preliminary schedule for Tue. and Thurs. sections as of July 21, 2016)

Aug 29 (Mon.)	First day of classes	
Aug 29 – Sept 1	Exp #1 - Review	
Sept 5 (Mon.)	no classes on Labor Day... lab meets rest of the week	
Sept 6 – 8	Exp #2 - Input and Output Impedance	
Sept 12 – 15	Exp #3 - Diodes and Rectification	Lab report due for Exp 2
Sept 19 – 22	Exp #4 - Capacitors and Low Pass Filters	
Sept 26 – 29	Exp #5 - Magnetic Fields and Inductance	Lab report due for Exp 4
Oct 3 - 6	Exp #6 - AC Circuits, Impedance, and Filters	Choose presentation topic
Oct 10 - 13	Exp #7 - The LRC Circuit and Resonance	Lab report due for Exp 6
Oct 17 - 20	<b>Student presentations - 15 minutes each</b>	
Oct 24 - 27	Exp #8 - Building a Crystal Radio	
Oct 31 - Nov 3	Exp #9 - The Transistor	
Nov 7 - Nov 10	Exp #10 - Transistor Amplifier Radio	Lab report due for Exp 9
Nov 14 - Nov 17	Exp #11 - Mixer and Multiplier	
Nov 21 - Nov 22	Makeup Labs	
Nov. 23 -27 (W-Sun)	Thanksgiving Break	
Nov 28 - Dec 1	Practice for practical exam	
Dec 5 - 8	<b>Practical Exam</b>	
Dec 12 (Mon)	Last Day of Classes	
Dec 13 (Tue)	Study Day	
Dec 14-20	Final Exams	