

## Physics 276 Syllabus - Spring 2015

### 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.**

#### 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, and a complete set of parts needed for constructing two types of AM radios. We do not have extras of some of the components, so 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.

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

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

#### Lab sections:

Lab section	Day	Time	Instructors	Teaching Assistant	Lab Room
0101	Monday	2-5:50 PM	V. Manucharyan	M. Yazdanpanah	3120 Phys
0201	Tuesday	2-5:50 PM	F. Wellstood	M. Yazdanpanah	3120 Phys
0301	Friday	2-5:50 PM	F. Wellstood	M. Yazdanpanah	3120 Phys
0401	Wednesday	2-5:50 PM	V. Manucharyan	S. Chandra	3120 Phys

**\*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**  
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**Prof. Vladimir Manucharyan**  
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**\* Teaching Assistants**  
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**office:**  
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\* **Prerequisites:** The prerequisites for the course are Physics 272 and Physics 275.

\* **Required Texts:**

(1) "*Physics 276 Lab Manual*" – Thirteenth Edition- August 2015.

The manual is a work in progress and will be distributed through ELMS Canvas

(2) "*A Practical Guide to Data Analysis for Physical Science Students*" by Louis Lyons.

\* **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.

\* **Arriving late to class:** Classes at Maryland begin right on the hour. It is important that you arrive on time so that you can get instructions for the lab and have time to finish. If you arrive more than 10 minutes late, you may not be allowed into the lab and will have to make it up during another section.

\* **Making Up Missed Labs:** You should make every effort not to miss your regularly scheduled lab. If you miss your regular lab section, you should make that lab up by going to another section that week or by scheduling a makeup lab with the TA before your next lab.

\* **Grading:**

- 10% Prelab Homework
- 25% Preliminary Spreadsheet Report with data, submitted at end of each lab
- 35% Formal Lab Report
- 10% Class Presentation
- 20% Practical Exam

**All experiments must be completed to pass the course.** 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 unusual, in which case a standard curve will be used.

\***Prelab Homework** is typically assigned for each Lab and its purpose is to make sure that you prepare before coming to the lab. You will need to complete your homework on ELMS Canvas and it will be due each week before the start of your lab. No credit will be given for late Prelab

homework unless you are seriously ill and provide a written note from your physician. The Prelab homework is a significant part of your grade.

**\*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 26 (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 can also be tested. Please note that the exams are 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 for each lab.
- (2) Read the lab manual carefully **before** you go to the lab and attempt an experiment.
- (3) During class, keep a complete 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 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

(Tuesday and Friday sections as of August 8, 2015 -  
note that Monday and Thursday sessions may differ)

Aug 31	First day of classes	
Aug 31 – Sept 4	Exp #1 - Review	
Sept 7 (Mon.)	no classes just on Labor Day... lab meets rest of the week	
Sept 8 – 11	Exp #2 - Input and Output Impedance	
Sept 14 – 18	Exp #3 - Diodes and Rectification	Lab report due for Exp 2
Sept 21 – 25	Exp #4 - Capacitors and Low Pass Filters	
Sept 28 – Oct 2	Exp #5 - Magnetic Fields and Inductance	Lab report due for Exp 4
Oct 5 - 9	Exp #6 - AC Circuits, Impedance, and Filters	Choose presentation topic
Oct 12 - 16	Exp #7 - The LRC Circuit and Resonance	Lab report due for Exp 6
Oct 19 - 23	<b>Student presentations - 15 minutes each</b>	
Oct 26 - 30	Exp #8 - Building a Crystal Radio	
Nov 2 - Nov 6	Exp #9 - The Transistor	
Nov 9 - Nov 13	Exp #10 - Transistor Amplifier	Lab report due for Exp 9
Nov 16 - Nov 20	Exp #10 - Transistor Amplifier and Radio	
Nov 23 - Nov 25	Makeup Labs	
Nov. 26 -27	Thanksgiving Break	
Nov 30 - Dec 4	Practice for practical exam	
Dec 7 - 11	<b>Practical Exam</b>	
Dec 11 (Fri.)	Last Day of Classes	
Dec 12 (Sat)	Study Day	
Dec 14-19	Final Exams	