PHYS485/685: Electronic Circuits-Fall 2024

Instructor: Sarah Eno

Office: Physical Sciences Building (PSC) room 3164

Office Hours: I'm always happy to meet with you. Email me for an appointment

e-mail: eno@umd.edu

Teaching Assistants:

Section 101 (Wednesday lab): Donghee Yeum ydh4575@umd.edu

Section 102 (Tuesday lab): Donghee Yeum ydh4575@umd.edu

Course Emphasis:

Physics 485/685 is a course in modern electronics with an emphasis on hands-on laboratory work and skills that are needed in experimental work. We will study a wide variety of analog circuits, with an emphasis on high speed measurements. The work will culminate in the construction of a working radar.

A second semester is offered as PHYS487/687. PHYS487/687 concentrates on interfaces between computers and measurement devices, including an introduction to the C++ programming language. PHYS487/687 does not require PHYS485/685 as a prerequisite. The work does require writing of code.

 Students can take either or both semesters.

Course prerequisites and major requirements:

The course has no prerequisites, but a previous electronics course similar to PHYS276 is highly recommended.

For undergraduate physics majors, upon consultation with your major advisor, this course (and the spring semester) can be used to fullfill the upper level lab course. For physics graduate students, upon consultation with the associate chair for graduate students, this can count towards your 3 required 600-level or higher courses.

Course meeting times

Lecture meets Monday 2-2:50 p.m. in PHYS 1204.

There are two laboratory sections each week--one on Tuesday (Section 0102) from 2:00 to 5:50 and one on Wednesday (Section 0101) from 1-4:50 p.m. Both meet in PHYS 3214.

Students who need to finish work can come to the instructor run through. The time for this is 2 -4 pm Thursdays (can go later with permission from the instructor) in the lab room.

Website:

The materials for this course will be available in elms.

Schedule:

The lab schedule can be found in the "Files" section on elms. **Please note that since this course is currently being revised, the specific labs done each week may need adjustment.**

Books

Required

- *Learning the Art of Electronics: A Hands-On Lab Course 1st Edition*. By Thomas C. Hayes ISBN-13 978-0521177238 (Do not confuse this $45 book with the much more expensive "The Art of Electronics" by Horowitz and Hill)

Recommended references

- Electronic Principles, Malvino

- Practical Electronics for Inventors, Scherz and Monk

- Understanding Basic Electronics, ARRL press

- The Art of Electronics, Horowitz and Hill

- Microelectronic Circuits, Sedra

- Solid State Electronic Devices, Streetman

- Principles of modern radar. basic principles. Richard, Scheer, Holm editors.

Prelab Prep

The labs in "Learning the Art of Electronics" are not the cookbook style labs that are used in lower-level laboratory courses. In order to complete your work on time during the laboratory session, you will need to do non-negligible preparatory work. This will be a substantial portion of your grade. Before each lab, you will be assigned a reading and pointed to the lab exercises in the text that will do during the lab session on Tuesday (section 102) or Wednesday (section 101). You must prepare notes for each lab item, based on the reading and the Friday lecture, that show you know what you will be doing and what knowledge you need from those references to do it and upload to elms before class. A substantial portion of your grade will be based on this work. The grading will be done after the lab, which will help the grader know how well prepared you were for class. The prelab should be in EXCEL format.

We will look for the following items for each exercise:

- A neat spreadsheet setup to just fill in the results

- Drawings of any circuits you intend to make that are not in your book.

- Graphs and tables presetup so you can just fill them in

- Formula needed for any calculation expected during the exercise

- Answers to any question in the "supplement" or in the text

- That during class you seem to be well prepared and know have a well developed plan for your measurements

Lab work

Lab work will be graded during class. For each lab exercise, you should put photos of your constructed circuit, links to data sheets of any non-generic component used, screen shots of any relevant signals, any other data you take during the exercise, and answers to any

questions into an EXCEL spreadsheet. There should be one "sheet" for each exercise (with the tab labeled). Once you finish an exercise, call the instructor or TA over for grading. Grading of the answers to questions will be based on showing you put thought into your answer, but not on the correctness of your response. You can also ask for help constructing the circuit or discussing any question before the grading occurs. The goal is for all students to get 100% on this part, if they will work with us to get to a completed circuit with good understanding. The spreadsheet should be uploaded at the end of class. **You will be given a check sheet at the beginning of class the instructor will use to indicate completion of each part and the grade. You should turn this piece of paper in at the end of class.**

In the spreadsheet, we will look for:

- Drawing of ALL circuits (or cut-and-paste photo of the circuit in the text) studied

- Photographs of ALL constructed circuits

- Any scope trace used as part of the measurement with text description of what it shows

- Any voltage/current measurements with text description of what is measures

- Updated answers to questions in supplement and text

- A legible version of every formula that you use

Quizzes

There will be a three-question multiple choice quiz in elms each Friday based on the readings and lab work from that week's lab.

Homework

There will be several homework assignments during the semester. For PHYS685, there will be more homework assignments.

Grades

The semester grade for the course will be determined in the following way:

Item	PHYS485	PHYS685
Prelab work	40%	40%
Lab work	30%	30%
Quizzes	15%	15%
Homework	15%	15%

Late Assignments:

Late work will have a 20% grade deduction.

Make ups:

There will be one scheduled makeup session at your regular course time. In addition, once the TA is assigned, there will be a weekly session at which both the TA and I will be present (while doing our own prep for the following week). Other times are possible by appointment. These times can also be used to finish a lab. Makeups are only allowed for students who are absent from their regular time due to a University-recognized reason.

University policies:

An official list of University academic policies can be found at: https://www.ugst.umd.edu/courserelatedpolicies.html. Please see this list for policies on University-recognized reasons for missing a class, policies regarding academic integrity including plagiarism, and other matters.

Disabilities:

If you have a documented disability, please contact me as soon as possible with the required paperwork.

Disclaimer:

The instructor reserves the right to make changes to this syllabus to meet the specific needs of the class during the semester. Any changes will be announced in ELMS.