Clark S24

Edit

Physics 276 - Experimental Physics II: Electricity and Magnetism

Course topics: Experimental methods and tools related to circuits. Topics include resistance, diodes, capacitance, inductance, AC circuits, transistors, and amplifiers.

Logistics

Instructor: Prof. Brian Clark, PSC 2105, Phone: 301-405-6036, e-mail: baclark@umd.edu (mailto:baclark@umd.edu) .

Office Hours: By appointment; contact me to schedule a meeting.

Schedule:

- Section 0301: Thursday 2:00pm-5:50 in PHYS 3203
- Section 0401: Wednesday 2:00pm-5:50 in PHYS 3203

Please see the schedule in the “Files” area of ELMS for our weekly agenda.

"PHYS 3203" means the Toll Physics Building, Room 3203.

Teaching Assistants (TA):

- Ernst Grunow (wgrunow@umd.edu): Mon/Thurs
- Elizabeth Kowalczyk (ekowal@umd.edu): Tue/Wed

Laboratory Managers:

- Mr. Allen Monroe, rm 3311, John S. Toll building, 5-6002, amonroe@umd.edu

- Mr. Greg Wolter, rm 3202, John S. Toll building, 5-6004, gwolter1@umd.edu

Texts

Reading for the laboratories is supplied via ExpertTA. **It is absolutely essential that you do the necessary reading *before* class begins**. Pre-labs are administered via ExpertTA to encourage diligence in the reading (see course requirements below). To access ExpertTA, you should follow the appropriate link below. You will then complete the payment and registration. Please **register with your UMD email address.**

Section	ExpertTA Registration Code
0101 (Monday)	http://goeta.link/USH22MD-912FF4-2N7 (http://goeta.link/USH22MD-912FF4-2N7)
0201 (Tuesday)	http://goeta.link/USH22MD-F14660-2N6 (http://goeta.link/USH22MD-F14660-2N6)
0301 (Thursday)	http://goeta.link/USH22MD-ADFB2F-2N5 (http://goeta.link/USH22MD-ADFB2F-2N5)
0401 (Wednesday)	http://goeta.link/USH22MD-F482E8-2N4 (http://goeta.link/USH22MD-F482E8-2N4)

The experimental lab instructions will be provided in the Files section of the ELMS area for this course. They will typically become available by Friday afternoon of the preceding week.

Optional Texts:

The following texts were used in preparation of the laboratory material, and may be useful to provide more context and information. Copies of these texts have been placed on hold at the STEM Library. You can find more information in the "Course Reserves" tab on ELMS.

- Electronic Principles, Malvino
- Practical Electronics for Inventors, Scherz and Monk
- Understanding Basic Electronics, ARRL press
- The Art of Electronics, Horowitz and Hill
- A Practical Guide to Data Analysis for Physical Science Students; Louis Lyons, Cambridge Press

- An Introduction to Error Analysis; J. R. Taylor, University Science Books
- Elements of Style, E.B. White and William Strunk

Course requirements

Experiments

During the lab, you will build circuits and conduct experiments on those circuits. Experimental science requires careful, well-documented, accurate data. You will create a notebook with your observations and documentation by using the Python-based **jupyterlab notebook software (https://jupyter.org)** . You will submit that notebook for grading at the end of each class period. You need to treat it like a real experimental notebook. You must include all information you might possibly need if somebody has a question about your result a year from now. This includes:

- Date
- Drawings and pictures of apparatus (use your cell phone camera, or the webcams on the lab computers) and the model numbers of equipment used
- All numbers must have neat accompanying text describing the number
- Your data, including uncertainties (both statistical and systematic.
- Analysis of data with propagation of errors
- Plots and histograms when appropriate, with intelligible labels

You will not get full credit if this information is missing. The notebook must be uploaded to ELMS by midnight the day after lab (the exact deadline is listed in Canvas). You should seek as much advice as you need during the lab. To get a good grade, you should ask many questions of your instructor, TA, and other classmates.

The in-class notebooks will be graded out of 100 points as follows:

- +20 points: the lab is neat, and all information, especially numbers, are well labeled. Partial credit can be assigned at the discretion of the TA.
- The TA will make a list of all quantities that the lab asks to be put into the spreadsheet. The total of +80 points will be divided by this number. If the required information for each item is either missing or incorrect, those points will be deducted.

Instructions and help for creating your Jupyter notebook will be covered in class. The easiest way to get the software installed on your computer is via the **Anaconda package**

(https://www.anaconda.com/download) . **You are strongly encouraged to install the Anaconda software on your own computers.** The software is free, works on all operating systems (windows, mac, and linux), and instructions for doing so are **available online** (https://docs.anaconda.com/free/anaconda/install/index.html) .

Pre-labs via ExpertTA

The ExpertTA software will administer a pre-lab consisting of ~5 questions. The pre-lab questions will be based on the lab manual, which is also uploaded to ExpertTA. Because it is essential that you have read the manual before class, **the pre-lab is due before class begins.** Incomplete pre-labs will receive a score of zero, unless you have made prior arrangements. (See the absences policy below.) Your ExpertTA pre-labs will contribute to your homework score.

Formal Laboratory Paper

You will write a formal paper of your results for Lab 3. Lab papers should be submitted as a PDF file. The papers should be submitted electronically using the ELMS system (**http://elms.umd.edu/** (http://elms.umd.edu/)), and will be due on the date indicated in ELMS. Please contact your instructor as soon as possible if an emergency occurs, delaying your submission. A detailed rubric, describing the lab paper requirements and how it will be graded will be linked to ELMS. Please note that the rules regarding plagiarism are relevant to lab papers. Large cut and pastes from the lab manual are not allowed. Any cut and paste of more than a sentence should be formatted following standard rules, to make it very clear which text comes from other's work.

Presentations

Each student will give a 15 minute oral presentation relevant to AM radio and telecommunications. You will suggest a topic, or choose one from a dedicated list, later in the semester.

The date for the presentations is given in the schedule on ELMS.

The presentation should be accompanied by electronic slides in pdf format A detailed grading rubric will is available on ELMS.

Homework

To help you develop your paper and presentation, there will be dedicated homework assignments over various components. For example, the title, abstract, and outline for the formal paper are due as

a dedicated homework assignment. The exact deadlines can be found in ELMS Canvas.

Final exam

The final exam will be a *practical* final. It will cover material from the semester. You will be expected to build a circuit, take data following appropriate experimental procedures, and explain the underlying physics. Knowledge of the workings of the instruments used in the lab will be tested. Please note that the use of google or any other external resource during the exam is expressly forbidden. If you have any questions either before or during the exam as to what resources can be used, please raise your hand and ask.

Grading

The grade is determined as a weighted average, using the weights given below. The plus/minus grading system is used.

- 50%: In-class notebooks
- 10%: Homework and ExpertTA Pre-Labs
- 10%: Formal lab paper
- 10%: Presentation
- 20%: Final Exam

Late work*: Late work will receive a 20% grade reduction.* No late work is accepted after reading day (exceptions can be made for severe unexpected emergencies). If you miss a deadline due to an excused absence, you must contact me to schedule a new deadline within a week of missing the work (exceptions can be made for severe emergencies).

Policies

Absences: This is an experimental course, and so attendance is absolutely essential to learning. If it becomes necessary to miss a lab period due to illness, etc., sometimes you can make up the lab during the meeting time of one of the other sections. However, you need explicit permission of the instructor for that section to do this. Only those with a valid written excuse for missing a lab will be considered. If you cannot schedule a makeup time during the same week in one of the existing

sessions, you will need to schedule an individual makeup time with your instructor. Students are responsible for notifying the instructor via email within the first two weeks of the semester about projected absences due to religious observances during the semester.

Safety and Decorum: We will be working with live electrical circuits. As such, your complete focus is necessary to ensure the safety of yourself and your classmates. Late arrival or the making of phone calls during the lab is not allowed. Eating and drinking in the lab is not permitted, though given the long duration of the lab, you are welcome to bring a drink/light snack to eat in the hallway. You should also wear proper laboratory attire; be mindful of your jewelry (e.g. watches and rings, which can conduct electricity!). Be sure to tie back long hair, etc.

Bad weather: Winter in the Washington Metro area can bring large snowstorms that make travel dangerous. Should this happen, and the University is closed as a result during a scheduled lab, class will be cancelled, and we will most likely reschedule the lab for the following week. Please look at ELMS for this class for details. Closing is announced on the University's homepage: **http://www.umd.edu/ (http://www.umd.edu/)** .

University policies: An official list of University academic policies can be found at: **http://www.ugst.umd.edu/courserelatedpolicies.html (http://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.

Accessibility and Disabilities: If you have a documented accessibility need, please contact me as soon as possible with your accommodation form from the **Accessibility and Disability Service (https://www.counseling.umd.edu/ads/)** (ADS) office. This will allow us time to make arrangements.

Disclaimer:

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

Course Summary:

Date	Details	Due
Thu Feb 1, 2024	**lab notebook 0** (https://umd.instructure.com/courses/1362384/assignments/6226113) (PHYS276-0401)	due by 11:59pm

Fri Feb 2, 2024	lab notebook 0 (https://umd.instructure.com/courses/1362384/assignments/6526179) (PHYS276-0301)	due by 11:59pm
Thu Feb 8, 2024	lab notebook 1 (https://umd.instructure.com/courses/1362384/assignments/6594029) (PHYS276-0401)	due by 11:59pm
Fri Feb 9, 2024	lab notebook 1 (https://umd.instructure.com/courses/1362384/assignments/6594029) (PHYS276-0301)	due by 11:59pm
Thu Feb 15, 2024	lab notebook 2 (https://umd.instructure.com/courses/1362384/assignments/6594029) (PHYS276-0401)	due by 11:59pm
Fri Feb 16, 2024	lab notebook 2 (https://umd.instructure.com/courses/1362384/assignments/6594029) (PHYS276-0301)	due by 11:59pm
Wed Feb 21, 2024	paper: outline and experimental setup (https://umd.instructure.com/courses/1362384/assignments/6596282) (PHYS276-0401)	due by 2pm
Thu Feb 22, 2024	paper: outline and experimental setup (https://umd.instructure.com/courses/1362384/assignments/6596282) (PHYS276-0301)	due by 2pm
	lab notebook 3 (https://umd.instructure.com/courses/1362384/assignments/6594029) (PHYS276-0401)	due by 11:59pm
Fri Feb 23, 2024	lab notebook 3 (https://umd.instructure.com/courses/1362384/assignments/6594029) (PHYS276-0301)	due by 11:59pm
Wed Feb 28, 2024	paper: analysis/results section (https://umd.instructure.com/courses/1362384/assignments/6596284) (PHYS276-0401)	due by 2pm

Thu Feb 29, 2024	paper: analysis/results section (https://umd.instructure.com/courses/1362384/assignments/6596284) (PHYS276-0301)	due by 2pm
	lab notebook 4 (https://umd.instructure.com/courses/1362384/assignments/6591039) (PHYS276-0401)	due by 11:59pm
	paper: analysis/results section (https://umd.instructure.com/courses/1362384/assignments/6596284) (1 student)	due by 11:59pm
Fri Mar 1, 2024	lab notebook 4 (https://umd.instructure.com/courses/1362384/assignments/6591039) (PHYS276-0301)	due by 11:59pm
	paper: analysis/results section (https://umd.instructure.com/courses/1362384/assignments/6596284) (1 student)	due by 11:59pm
Wed Mar 6, 2024	paper: abstract, introduction, and conclusion (https://umd.instructure.com/courses/1362384/assignments/6596285) (PHYS276-0401)	due by 2pm
Thu Mar 7, 2024	paper: abstract, introduction, and conclusion (https://umd.instructure.com/courses/1362384/assignments/6596285) (PHYS276-0301)	due by 2pm
	lab notebook 5 (https://umd.instructure.com/courses/1362384/assignments/6591039) (PHYS276-0401)	due by 11:59pm
Fri Mar 8, 2024	lab notebook 5 (https://umd.instructure.com/courses/1362384/assignments/6591039) (PHYS276-0301)	due by 11:59pm

Sat Mar 9, 2024	lab notebook 5 (https://umd.instructure.com/courses/1362384/assignments/6591031) (1 student)	due by 11:59pm
Wed Mar 13, 2024	formal lab paper (https://umd.instructure.com/courses/1362384/assignments/6591029) (PHYS276-0401)	due by 11:59pm
Thu Mar 14, 2024	formal lab paper (https://umd.instructure.com/courses/1362384/assignments/6591029) (PHYS276-0301)	due by 11:59pm
	lab notebook 6 (https://umd.instructure.com/courses/1362384/assignments/6591033) (PHYS276-0401)	due by 11:59pm
Fri Mar 15, 2024	lab notebook 6 (https://umd.instructure.com/courses/1362384/assignments/6591033) (PHYS276-0301)	due by 11:59pm
Wed Mar 27, 2024	homework lab 7 (https://umd.instructure.com/courses/1362384/assignments/6740329) (PHYS276-0401)	due by 2pm
Thu Mar 28, 2024	homework lab 7 (https://umd.instructure.com/courses/1362384/assignments/6740329) (PHYS276-0301)	due by 11:59pm
	lab notebook 7 (https://umd.instructure.com/courses/1362384/assignments/6591035) (PHYS276-0401)	due by 11:59pm
Fri Mar 29, 2024	lab notebook 7 (https://umd.instructure.com/courses/1362384/assignments/6591035) (PHYS276-0301)	due by 11:59pm
Wed Apr 3, 2024	presentation: upload topic choice, read article on physics presentations (https://umd.instructure.com/courses/1362384/assignments/6591038) (PHYS276-0401)	due by 2pm

Thu Apr 4, 2024	presentation: upload topic choice, read article on physics presentations (https://umd.instructure.com/courses/1362384/assignments/6591038) (PHYS276-0301)	due by 2pm
	lab notebook 8 (https://umd.instructure.com/courses/1362384/assignments/6591034) (PHYS276-0401)	due by 11:59pm
Fri Apr 5, 2024	lab notebook 8 (https://umd.instructure.com/courses/1362384/assignments/6591034) (PHYS276-0301)	due by 11:59pm
Wed Apr 10, 2024	presentation: outline (https://umd.instructure.com/courses/1362384/assignments/6596582) (PHYS276-0401)	due by 2pm
	presentation: outline (https://umd.instructure.com/courses/1362384/assignments/6596582) (1 student)	due by 11:59pm
Thu Apr 11, 2024	presentation: outline (https://umd.instructure.com/courses/1362384/assignments/6596582) (PHYS276-0301)	due by 2pm
	lab notebook 9 (https://umd.instructure.com/courses/1362384/assignments/6591037) (PHYS276-0401)	due by 11:59pm
Fri Apr 12, 2024	lab notebook 9 (https://umd.instructure.com/courses/1362384/assignments/6591037) (PHYS276-0301)	due by 11:59pm
Wed Apr 17, 2024	presentation: figures and sample slide (https://umd.instructure.com/courses/1362384/assignments/6596589) (PHYS276-0401)	due by 2pm
	presentation: figures and sample slide (https://umd.instructure.com/courses/1362384/assignments/6596589)	due by 2pm

	(PHYS276-0301)	
Thu Apr 18, 2024	lab notebook 10 (https://umd.instructure.com/courses/1362384/assignments/6591039) (PHYS276-0401)	due by 11:59pm
	presentation: figures and sample slide (https://umd.instructure.com/courses/1362384/assignments/6596589) (2 students)	due by 11:59pm
Fri Apr 19, 2024	lab notebook 10 (https://umd.instructure.com/courses/1362384/assignments/6591039) (PHYS276-0301)	due by 11:59pm
	presentation: figures and sample slide (https://umd.instructure.com/courses/1362384/assignments/6596589) (1 student)	due by 11:59pm
Wed Apr 24, 2024	oral presentation (https://umd.instructure.com/courses/1362384/assignments/6591037) (PHYS276-0401)	due by 2pm
Thu Apr 25, 2024	oral presentation (https://umd.instructure.com/courses/1362384/assignments/6591037) (PHYS276-0301)	due by 2pm
Fri May 3, 2024	practice exam (https://umd.instructure.com/courses/1362384/assignments/6763678)	due by 11:59pm
	Final Exam (https://umd.instructure.com/courses/1362384/assignments/6591024)	
	Final Exam -- Part 1 (https://umd.instructure.com/courses/1362384/assignments/6758156)	
	pre-lab 1 (https://umd.instructure.com/courses/1362384/assignments/6591446)	

pre-lab 10 (https://umd.instructure.com/courses/1362384/assignments/65914

pre-lab 2 (https://umd.instructure.com/courses/1362384/assignments/6591447)

pre-lab 3 (https://umd.instructure.com/courses/1362384/assignments/6591449)

pre-lab 4 (https://umd.instructure.com/courses/1362384/assignments/6591448)

pre-lab 5 (https://umd.instructure.com/courses/1362384/assignments/6591450)

pre-lab 6 (https://umd.instructure.com/courses/1362384/assignments/6591451)

pre-lab 7 (https://umd.instructure.com/courses/1362384/assignments/6591452)

pre-lab 8 (https://umd.instructure.com/courses/1362384/assignments/6591453)

pre-lab 9 (https://umd.instructure.com/courses/1362384/assignments/6591454)