

## PHY 330 ELECTRONICS - SPRING 2024

### Course Meeting Times and Locations:

**Lecture:** M & W 11:00-11:50 a.m. (SECC 368)

**Lab:** Tues 10:00-11:50 a.m. (SECC 368)

### Instructor Information:

Prof. Robert Thornton

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### Course Description

Electronics is a hybrid lecture and laboratory course. Through this course, you will learn the theory behind the operation of fundamental circuits. This includes DC/AC and analog/digital circuits, the type of which you are likely to encounter in industry or a research laboratory. Along the way, you will build circuits to test the theory and better understand the behavior of those circuits. You will also develop the knowledge and skills necessary to design and build simple circuits yourself.

### Course Management

All course documents will be on the course D2L website. Outside of class, I generally use email to communicate (rather than posting D2L announcements). I tend to send out a lot of emails so please check your email frequently (at least once a day).

### Spring 2024 Office Hours

If you need help, I will find a time to meet with you, whether it's during posted office hours or not. I will likely be at UPenn Wednesday afternoons and all day on Friday but can meet via Zoom while I'm there or even stop by WCU to meet on my way back from Philadelphia (~6:30-ish, which I've done many times). I am thinking of having my "official" hours during the times below but can adjust if these times are particularly bad for the majority of people.

Mon: 2:00 p.m. – 4:00 p.m.

Tuesday: 1:00 – 3:00 p.m.

Thursday: 1:00-2:00 p.m.

Zoom meeting ID: [944 330 2731](#)

Zoom password: rjtwcu

### Required Course Materials

Text: *Electronics for the Undergraduate Physicist*, M. M. Waite (available at Sykes bookstore)

Lab Manual: *Physics 330 Spring 2024 Laboratory Manual*, M. M. Waite (posted on D2L)

A new laboratory notebook (the Bookfactory ones they sell at the Sykes bookstore)

A scientific calculator

For several reasons, I will require each student to bring hardcopies of the lab instructions for each lab. You will not be allowed in lab without a hardcopy of that week's lab instructions (sounds strict but if I'm not, there will be some students who just won't do it). Regarding the lab notebooks, I am requiring new lab notebooks because you will fill up most of your notebook, not to mention things will be clearer to me when I grade the notebooks. I realize that they are not inexpensive, but we are providing the lab manual for free this year so that will offset the cost.

### **Attendance Policy**

Attendance is required, not just to encourage your learning but also to help your fellow students learn. There will be about 5-10 in-class homework quizzes (we will have to see how things go). They will be very short and involve a single problem based on the material covered by recent homework. I will write them so that if you made a sincere attempt at the homework and understood most of the concepts, you should be totally fine (the problem on each quiz will be shorter and easier than most, if not all, of the homework problems). I am doing this primarily to encourage you to both do the homework (see homework policy for more explanation) honestly and to keep up with the material. If an event beyond your control prohibits you from attending class, please let me know. I will drop the lowest quiz grade.

### **Homework Policy**

Working (and struggling) through problems is critical for learning the material. If you are stuck on a homework problem, there are plenty of avenues other than going on Chegg, etc. Peeking at a solution may get you to the next step, but that is a slippery slope. You are better served by going back to your notes, asking your instructor or a fellow student, or even watching online videos. Since I cannot prevent students from cheating on the homework, which is both unfair to other students and doing a disservice to yourself, homework will be only 5% of your grade. The encouragement to do the homework honestly is that the homework quizzes will count more than the actual homework. If you simply copy solutions to the homework, you will fail the homework quizzes (and likely the exams).

### **Assessment**

- Homework 5%
- Homework quizzes 10%
- Lab 20%
- Midterm 1 15%
- Midterm 2 15%
- Midterm 3 15%
- Final exam 20%

## Student Learning Outcomes

1. Reinforce understanding of the concepts of voltage and current, including sign conventions.
2. Reinforce understanding of Ohm's Law and Kirchhoff's Laws.
3. Use various methods (Node-voltage, mesh-current, Thevenin-Norton simplification) to analyze circuits and solve for common quantities of interest.
4. Describe the function of resistors, capacitors, inductors, op-amps, diodes, and transistors.
5. Analyze first order and second order (RL, RC, and RLC) circuits.
6. Understand complex impedance and perform AC analysis of circuits.
7. Describe the function of low-pass, high-pass, and band-pass filters and understand how these filters are implemented in circuits.
8. Explain the theory behind digital logic circuits and use various techniques to simply and predict the behavior of these circuits.
9. Become proficient in building circuits involving these circuit elements and performing diagnostic tests on those circuits to understand their behavior.

## Program Goals

The lecture portion of this course (SLOs 1-8) supports the following Physics Program goal with regard to the application of the knowledge of electricity and magnetism to electronic circuits. This program goal will be assessed using homework assignments, homework quizzes, and exams.

### *Knowledge and Understanding of the Concepts and Principles of Physics*

B.S. Physics who graduate from West Chester University will possess a firm foundation of basic physics principles, as well as general knowledge of physical phenomenon and applications of these phenomenon. Knowledge areas will include classical mechanics, electricity and magnetism, thermodynamics, statistical physics, and quantum mechanics.

The laboratory portion of this course (SLO 9) supports the following Physics Program goal and will be assessed using laboratory performance as illustrated in laboratory notebooks.

### *Research Skills and Information Literacy*

B.S. Physics Majors who graduate from West Chester University will develop the laboratory skills needed to work in a research environment. This skill set will include experiment design and execution, data analysis, familiarity with common measurement instrumentation (e.g. multimeter), and safety practices in a laboratory setting.

## The Laboratory Notebook

You will need to maintain a laboratory notebook (a new Bookfactory notebook) during this course, like you did in PHY 170/180. It is assumed that you know how to thoroughly document an experiment in a laboratory notebook. More details of what is expected are on D2L. After each experiment, your notebook will be graded. Other than the posted lab notebook guidelines, the grade will also be based on how easy

it is for me to understand what you did in lab, considering that the laboratory notebook is not "prepared" in a manner of a formal report but a record of an experiment in real time. There should be clear delineations between experiments. If you have any questions, please do not hesitate to ask.

### **Midterm Exams**

There will be three exams during the regular semester, and one final exam (final exam discussed below). Failure to take an exam, unless it is an excused absence according to university policy OR accompanied by a doctor's note no more than 24 hours after the exam, will result in a zero for that exam. If at all, possible, you are encouraged to take the exam as scheduled. It is difficult to write makeup exams that are identical in difficulty (especially from a student's perspective, which is not always the same as the that of the instructor). Also, we will have moved further into new material by the time of a makeup.

### **Final Exam**

The date and time of the final exam for this course (as set by the registrar) is given in the schedule below. ***You should plan to be available for the entire finals week in case of inclement weather, etc.*** We have in past semesters had to reschedule finals due to weather related events. Missing the final exam will result in a zero for the exam unless extreme circumstances apply.

### **Electronic Device Policy**

The pace of the course is such that your undivided attention will be required for the entire lecture and lab period. Please set all electronics to silent or "vibrate mode" and put them away, so that both you and your neighbors will be able to concentrate on the material at hand. No laptops are allowed in class unless you have a valid reason (from observing others' classes I have found that 90% of the time laptops are used for things other than the current class). Anyone seen texting or using their cell phone will be asked to leave the classroom.

### **Intellectual Property Statement**

The instructor utilizes copyrighted materials under the “Freedom and Innovation Revitalizing the United States Entrepreneurship Act of 2007” (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyrighted by the instructor, including, but not limited to, lectures, course discussions, course notes, slides, assessment instruments such as exams, and supplementary materials posted or provided to students authored by the instructor. No recording, copying, storage in a retrieval system, or dissemination in any form by any means of the intellectual property of the instructor, in whole or in part, is permitted without prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals of the semester in which this course is held.

### **Academic & Personal Integrity**

It is the responsibility of each student to adhere to the university’s standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another’s work and/or using ideas of another and presenting them as one’s own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the [Ram’s Eye View](#), and the University website at [www.wcupa.edu](http://www.wcupa.edu).

### **Accommodations for Students with Disabilities**

West Chester University is committed to providing equitable access to the full WCU experience for Golden Rams of all abilities. Students should contact the [Office of Educational Accessibility \(OEA\)](#) to establish accommodations if they have had accommodations in the past or if they believe they may be eligible for accommodations due to a disability, whether or not it may be readily apparent. There is no deadline for disclosing to OEA or for requesting to use approved accommodations in a given course. However, accommodations can only be applied to future assignments or exams; that is, they can’t be applied retroactively. Please share your letter from OEA as soon as possible so that we can discuss accommodations.

If you have concerns related to disability discrimination, please contact the university’s ADA Coordinator in the [Office of Diversity, Equity, and Inclusion](#) or 610-436-2433.

### **Excused Absences Policy**

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the “responsibility for meeting academic requirements rests with the student,” that this policy does not excuse students from completing required academic work, and that professors can require a “fair alternative” to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

### **Reporting Incidents of Sexual Violence**

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University’s commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report incidents of sexual violence shared by students to the University’s Title IX Coordinator. The only exceptions to the faculty member’s reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. **Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University Protection of Minors Policy.** Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: [Office of Diversity, Equity, and Inclusion](#)

### **Inclusive Learning Environment and Anti-racist Statement**

Diversity, equity, and inclusion are central to West Chester University’s mission as reflected in our [Mission Statement](#), [Values Statement](#), [Vision Statement](#) and [Strategic Plan: Pathways to Student Success](#). We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism.

Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU's [Office for Diversity, Equity, and Inclusion](#) (ODEI), DEI committees within departments or colleges, the [student ombudsperson](#), and centers on campus committed to doing this work (e.g., [Dowdy Multicultural Center](#), [Center for Women and Gender Equity](#), and the [Center for Trans and Queer Advocacy](#)).

Guidance on how to report incidents of discrimination and harassment is available at the University's [Office of Diversity, Equity and Inclusion](#).

### **Emergency Preparedness**

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit [WCU Alert](#). To report an emergency, call the Department of Public Safety at 610-436-3311.

### **Electronic Mail Policy**

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.