

PHY335: Electronics and Instrumentation Lab - Fall 2023
Department of Physics and Astronomy

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Course Information

Course Title: Electronics and Instrumentation Lab

Course Designator, Section: PHY335 (all sections)

SBC Designation: TECH

Credits: 3

Pre-requisites: PHY 251 and WRT 102

Semester, Year: Fall, 2023

Meeting Time:

L01: Tue/Thu 1:00PM-3:50PM

L02: Mon/Wed 2:30PM-5:20PM

Classroom Location: Room A-127 + TBD

Instructor Information

Instructor Name: Ross Corliss

Instructor Email: ross.corliss@stonybrook.edu

Office Hours: In-person Wed 10:00-12:00. Online via email, or zoom by appointment

Office Location: C-103

TA Contact Info: TBD

Required Course Materials

You are required to have **two physical lab books**, in which you will record data, take notes, sketch circuits as you work in lab. After finishing a unit, you will submit your lab book to the TA for grading, and use the second book for the next unit. Lab books must be paper, with a hard binding that prevents easily adding or removing pages.

There is no specific required textbook, but note that reading a textbook section covering the topic of each lab section is **extremely highly recommended**, since in-class lectures will not cover all details of the material.

Recommended Course Materials

I recommend Horowitz and Hill, [The Art of Electronics](#) (Cambridge University Press, 2nd or 3rd edition). This book is an excellent, concise resource, and has a great deal of material beyond what will be covered in this course. Rizzoni, [Principles and Applications of Electrical Engineering](#) (McGraw-Hill), often has more examples and more mathematical detail. You should find a textbook style that suits you. Suggested readings are given as AoE 3rd edition chapters. If you are using a different text, you can use <https://artofelectronics.net/the-book/table-of-contents/> to find the comparable chapters.

Other textbooks include:

- Curtis A. Meyer, [Basic Electronics: An Introduction to Electronics for Science Students](#)
- Hayes and Horowitz, [Student Manual for the Art of Electronics](#)
- Alexander and Sadiku, [Fundamentals of Electric Circuits](#)
- J. R. Cogdell, [Foundations of Electrical Engineering](#)

Course Description

Students will design, build, and test basic DC and AC circuits which perform a useful function, as viewed by physicists, involving resistors, capacitors, transformers, diodes, transistors, and operational amplifiers. Students will measure these circuits using digital multi-meters and digital oscilloscopes. Understanding of analog circuits will be stressed including negative feedback applied to operational amplifiers. Two three-hour laboratories per week. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

The course is arranged in units which cover related topics. Each unit will span multiple lab periods. For preparation at the start of each unit, read the unit instructions (linked below) and the material covering the listed topics. In groups of 2 (rarely 3), you will perform lab assignments. Time in the lab is limited, and extensions will only be granted in exceptional circumstances.

You should make a best effort to participate equally in the experimental work, including making sure you are giving your lab mate the opportunity to participate. You will write separate lab reports after each unit, and submit them for grading along with your lab book. You may work on these reports with your lab mate, but you are responsible for all contents of your submission: You should be able to explain all parts of it without your partner's support. Any attempt to copy from other people's reports or to make up data is academic misconduct and will lead to a zero grade and possible further action.

Most lab periods will start with a short lecture. Please be on time.

Laboratory Etiquette

You will be working in a lab space shared with other students. Please keep the lab clean and return components to the correct parts containers when finished with them. If your workbench is found untidy after class, points *may* be deducted. If you throw away working parts to clean up faster, points will be deducted.

Learning Objectives

By the end of the semester, students will be able to apply technical tools and knowledge to practical systems and problem-solving:

- Describe the function and uses of basic electronic components
- Design and construct simple circuits for a variety of purposes
- Perform measurements with a DMM and oscilloscope
- Analyze the performance of simple circuits
- Perform basic data analysis including error propagation

Assessments

The grade for each of the units will be based on lab books and lab reports. At least six units, the midterm, and the final must be completed to pass this course. Your base grade will be based on the six highest unit grades, while the seventh will be converted to bonus points (at a discounted rate).

Assessment/Assignment/Exam	Points or Percentage	Due Date
Units, including lab book and lab report	10 x 6 = 60	
Midterm exam	20	
Final exam	20	
Total	100	

Laboratory Reports

Lab reports must be turned in as a physical copy. They can be handwritten if the handwriting is legible, but I encourage preparing these on a computer e.g. with LaTeX, or Word. LaTeX is in common use in the physics community, and many free implementations exist. I highly recommend the website overleaf.com, which handles the minutiae of compiling a document. The reports should include:

1. Introduction
 - 1-2 pages
 - Describe the electronic components you are studying, and the studies you will perform
 - Include all relevant theory and equations (generally those found in bold at the top of the lab instructions)
2. Data
 - Data in the lab notebook should also be in the lab report.
 - Draw circuit diagrams!
 - Include error bars on plots and data tables
3. Analysis
 - Does experiment agree with theory prediction?
 - Include a discussion of statistical and systematic errors
 - Explain if the experiment was successful. If not, propose what one could do next (ie a way to correct a problem that was encountered).
4. Short conclusion / summary

The introduction for a unit is due on the first day of that unit. The TA or professor will sign below the text during that lab session (make sure that it is signed before you leave!), and it will be graded along with the report by the TAs. Lectures for a unit will be given during the last day(s) of the unit before, so make sure to plan your experiment time accordingly. For Unit 1, the deadline for the intro will be the first day of the second week. You can update your intro when you write your actual report.

Note that the lab book will be part of the grading, so make sure that it contains all the data, schematics etc. that you encounter during your work.

Exams

There will be *Midterm Exam* during the semester, and a *Final Exam* in the last week of class. Exams include a practical part, where you have to complete experimental tasks in the lab, and a written part, where you have to explain the relevant theory (for example, derivation of essential formulas) and perform data analysis. Following the reading guidelines and taking notes at mini-lectures are important to prepare for this.

Each exam will resemble the lab period and the writing of the report, all combined in the interval of 1/2 a lab period. The exams are given in two shifts, so that each student will have to work on the exam problems on his or her own. Active and equal participation in experimental work and study of the material covered in mini-lectures during the course will prepare you for the exams.

Response Time and Feedback on Assignments

Lab reports will generally be returned approximately one week after they are handed in. Lab notebooks will be returned on or before the last day of the alternate unit, ie Unit 1 notebooks will be returned by the last day of Unit 2, Unit 2 notebooks will be returned by the last day of Unit 3, etc.

Grade Scale

These thresholds are a general guideline, and may be modified depending on class performance.

Letter Grade	Percentage/ Points
A	95-100
A-	90-94
B+	86-89
B	83-85
B-	79-82
C+	75-78
C	71-74
C-	67-70
D+	64-66
D	60-63
F	0-59

Additional information

- [Undergraduate Grading System](#)
- [Graduate Grading System](#)

Course Schedule

Unforeseen events may make schedule changes necessary. Any changes will be clearly noted in Brightspace Announcements or through Stony Brook email. You are responsible for monitoring your stonybrook email on a regular basis.

Dates	Unit	Topic	Intro Due	Report Due	Reading
8/28, 8/29	0	Introduction			
8/30- 9/12	1	Lab Instruments, Signals, Resistors	9/06, 9/07	9/18, 9/19	AoE ch 1.1-1.3
9/13- 9/21	2	Capacitors, Inductors, RC Filters	9/13, 9/14	9/27, 9/24	AoE ch 1.4,1.5,1.7
9/25- 9/28	3	Diodes and DC power	9/25, 9/26	10/04, 10/05	AoE ch 1.6
10/02- 10/05	4	Simulation and PCB Design	10/02, 10/03	10/16, 10/17	
10/11- 10/26	5	Operational Amplifiers	10/11, 10/12	11/06, 11/07	AoE ch 4
10/30, 10/31	Midterms	Exam on units 1-5			
11/01- 11/16	6	Transistors	11/01, 11/02	11/27, 11/28	AoE ch 2 and 3
11/20- 12/05	7	Digital Electronics	11/20, 11/21	12/11.	AoE ch 10,(11),12.1-12.3,13.1- 13.5, (13.5-13.14)
12/06, 12/07	Finals	Exam on units 1-7, focus on 6-7			

Student Success Resources: How to Be a Successful Student in This Course

Time in the lab will go faster than you think, so come prepared to class. Sketch out circuits before you arrive. Even if they are not correct, the exercise will make you think through a layout without taking up lab time.

Remember to pause and take notes. When in doubt, write it down. Sketch it. If you need to correct something, cross it out neatly -- don't scribble things out. Take more notes in your lab notebook than you think you should.

Make sure you take your fair share of operating the equipment, building the circuits, etc. You will have to do these things on the exams.

Get used to searching the internet! Manuals, datasheets, and other resources are available if you type in the device name.

Reach out if you have questions or concerns, about the material or anything else in the course. Outside of the prof and TA, there are multiple resources, university offices, and help desks that are available to assist you with everything from advising, tutoring, accessibility and much more. Review some [Academic Success Strategies](#) and visit the [Student Resources](#) page for links to resources on campus.

University Policies

Student Accessibility Support Center Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website: <https://ehs.stonybrook.edu//programs/fire-safety/emergency-evacuation/evacuation-guide-disabilities> and search Fire Safety and Evacuation and Disabilities.

Academic Integrity Statement

Each student must pursue their academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Understand When You May Drop This Course

If you need to drop or withdraw from the course, it is your responsibility to be aware of the tuition liability deadlines listed on the registrar's [Academic Calendar](#). Before making the decision to drop/withdraw you may want to [contact me or] refer to the University's policies:

- [Undergraduate Course Load and Course Withdrawal Policy](#)
- [Graduate Course Changes Policy](#)

Incomplete Policy

Under emergency/special circumstances, students may petition for an incomplete grade. Circumstances must be documented and significant enough to merit an incomplete. If you need to request an incomplete for this course, contact me for approval as far in advance as possible. You should also read the University's policies that apply to you:

[Undergraduate Bulletin](#)

[Graduate Bulletin](#)

Course Materials and Copyright Statement

Course material accessed from Brightspace, Zoom, Echo 360, VoiceThread, etc. is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder, is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity.