

Analog and Digital Electronics

PHYS 0525, Spring 2022

Lecture: Tuesdays, 11-12:55, 106 Allen (after first 3 weeks)

Lab: Tuesdays, 2-4:55, 340 OEH (after first 3 weeks)

General Information:

Instructor: Michael Hatridge

Instructor Office: NA (for now)

Office Hours: For the present, office hours will be via zoom (Hours: **TBD** or by appointment)

Email: hatridge@pitt.edu

Zoom link for live lectures weeks 1-3: <https://pitt.zoom.us/j/98218566690>

pw: 34985935 **for classes from Jan 11 to Feb 1.**

Lab Manager: Dr. Istvan Danko, 329 OEH, phone: 412-624-9030, e-mail: izdanko@pitt.edu

Teaching Assistant: Maksim Gomanko, mag362@pitt.edu Office Hours: **TBD**

Textbook: Electronics Principles. 8ed

Author: A. Malvino and D. Bates

Publisher: McGraw Hill

ISBN-13: 978-0073373881

ISBN-10: 0073373885

Course description:

Physics 0525 is a one-term lecture and laboratory course that introduces basic electronic circuits. The emphasis is on hands-on laboratory work, such as using standard electronic test instruments, building and testing circuits. The weekly lectures cover the theory of analog and digital electronics. Whenever possible, the lectures will include a discussion of lab project of the week, but it is not always possible to synchronize labs and lectures exactly. Therefore, you should always read the chapter of the textbook that deals with the subject of the current lab experiment.

List of Labs (subject to change)

Week 1: no lab

Week 2: Lab 1 DC circuits: breadboard and DMM; voltage and current divider.

Week 3: Lab 2 RC circuits: function generator and oscilloscope; capacitor charging, RC differentiator and integrator.

Week 4: Lab 3 AC circuits: RC low- and high-pass filter, RLC resonance.

Week 5: Lab 4 Diodes: rectifiers, diode clamping, limiting.

Week 6: Lab 5 Bipolar transistors: emitter follower, current gain, common emitter amplifier.
 Week 7: Lab 6 Field-effect transistors: JFET characteristics, current source, source follower.
 Week 8: Lab 7 Op-amps I: basic negative-feedback circuits.
 Week 9 Lab 8 Op-amps II: comparator, Schmitt trigger (positive feedback), RC relaxation oscillator*.
 Week 10: Lab 9 Transmission lines: coaxial cable characteristics, reflections and impedance matching.
 Week 11: Lab 10 Digital logic: logic gates, flip-flop.
 Week 12: Lab 11 Arduino I: digital and analog input/output.
 Week 13: Lab 12 Arduino II: hardware and software interrupts, parallel/serial communication.
 Week 14: Lab 13 Arduino III: PID temperature control.

Course Grade Weights:

Laboratory Reports	55%
Homework	15%
Midterm Exam	15%
Final Exam	15%

The **laboratory reports** guide your lab work. Each week's report is provided via CANVAS, **please bring it printed to lab and use it as a worksheet**. The format of the lab hand-outs is such that most measured data and their analysis can be entered directly in blank spaces or in the blank graph forms. Labs often contain one or more calculations to be done during the lab or afterwards if there is insufficient time. Lab reports are due one week (unless otherwise specified) after the lab, and are to be submitted electronically via CANVAS via scanning or a similar app. Each student is responsible for their own report. **Homework** will be drawn from the lectures and textbook, and will be assigned and turned in electronically via CANVAS. **Both homework and labs will be assessed a 20% penalty per day late**. There will also be a **midterm** and **final exam** (in the lecture portion of the class) which will cover all material in the course, including lectures, the textbook, and lab work.

COVID:

The plan for this course is, at present, partially online for the first three weeks, and then fully in-person thereafter. Lectures 1-3 will be offered via synchronous zoom. Contact me as soon as possible if you are unable to attend and participate. These lectures may be recorded for use this semester only by class members. Week 1 will have no laboratory work, weeks 2 and 3 will be in person for those available and via at-home kits for those who cannot attend for reasons of university move-in and covid policy. If you cannot attend class or laboratory after week three due to, for instance COVID quarantine or isolation, please contact me as soon as possible.

At present office hours will be offered via zoom, should this change during the semester I will update this syllabus and notify you via Canvas (see Canvas information below). Information about Pitt's COVID policy can be found at <https://www.coronavirus.pitt.edu/>; health and safety requirements for students, faculty, etc. can be found at <https://www.coronavirus.pitt.edu/healthy-community/pitts-health-rules/>. In the unhopd for event that we must further modify the course during the semester updates will be made to this syllabus and posted to Canvas. If you are required to isolate or quarantine, become sick, or are unable to come to class, contact me as soon as possible to discuss arrangements.

Technology for this course:

Course website: Canvas, accessed via <https://canvas.pitt.edu/>. The University of Pittsburgh provides a web-based resource called Canvas, which is a portal to web sites for individual courses. A Canvas site for this course has been created and there you can view announcements, send email to the instructor, and download course material such as the syllabus.

- Use your Pitt email username and password to login to Canvas. If you have forgotten your username and password or need to set up an account, contact the help desk at 412-624-4357, or 4-HELP. Once you have logged into the system simply click on the link for this course to access the available material.
- **Note: users can configure which site changes trigger email notification, I recommend activating email notification for course announcements.**

Academic Integrity:

Students in this course will be expected to comply with the [University of Pittsburgh's Policy on Academic Integrity](#). Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

To learn more about Academic Integrity, visit the [Academic Integrity Guide](#) for an overview of the topic. For hands- on practice, complete the [Understanding and Avoiding Plagiarism tutorial](#).

Disability Resource Statement:

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union, 412-648-7890/412-624-3346 (Fax), as early as possible in the term.

Disability Resources and Services will verify your disability and determine reasonable accommodations for this course. For more information, visit www.studentaffairs.pitt.edu/drsabout.

Religious Observances

The observance of religious holidays (activities observed by a religious group of which a student is a member) and cultural practices are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, you should review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance. If at all possible, please contact me (your course coordinator/s) within the first two weeks of the first class meeting to allow time for us to discuss and make fair and reasonable adjustments to the schedule and/or tasks.