Physics 432: Digital Electronics

Instructor: Prof. Laura Jeanty – ljeanty@uoregon.edu
Office Hours (405 Willamette or virtual): TBD or by appointment

GTF Contact Information, Tutorial and Office Hours
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Lectures: MW, 14:00 - 15:50 Willamette 318
Lab: 3 hours in Willamette 11, schedule TBD
Textbook: Analog and Digital Electronics by Dan Steck, Chapters 9+
free! https://atomoptics.uoregon.edu/~dsteck/teaching/electronics/electronics-notes.pdf

Overview: This course is designed to provide a basic working knowledge of digital electronics, suitable for performing experimental research in science.

Course Goals:
This course will cover the following topics:

• Binary arithmetic and logic gates
• Combinational logic: multiplexer, decoders
• Sequential logic: flip-flops, counters
• Finite state machines
• Programmable logic

Reading:
Read the assigned reading from Steck’s notes / PDF each week.

Supplemental resources include:
   The Art of Electronics. Horowitz and Hill: Useful as a reference
   Student Manual for Art of Electronics: Hayes and Horowitz: Notes to supplement the Art of Electronics.

Both of the above resources will be available on reserve in the Science Library this term.

Homework:
Homework allows you to work through the course concepts by hand and focus more on the calculations, logic, and theory behind the material you will explore in lab.
Homework will be typically assigned on Mondays and is due the following Monday at the beginning of lecture. Late homework will not be accepted as I will post solutions and potentially discuss problems after they are turned in. I will drop your lowest HW score, so you get one free pass for a late or missing HW during the term.

Labs
Labs will take place in WIL 11. Each lab should take about 3 hours. There will be two lab sessions scheduled; during this time the TA or URA will be present in the lab room to answer questions. You are encouraged to attend lab during the scheduled time, but welcome to work on your own lab at another time if you need more time or can’t make the scheduled time. Please work through the lab on your own, but you can ask your peers for help or discuss the material with them.

Lab reports
Lab reports are due Monday in class, the week after labs are assigned. The goal of the reports to ensure you completed the lab and understood the material. Please get a lab notebook you can use for the whole term; this notebook can serve as both your notes during the lab and your lab report.

For the report, please make sure you’ve answered the questions in the lab, provide the notes you took during the lab, and provide a short summary afterward. This can all be in your lab notebook.

Exams
Midterm exams will be given in class, unless you have an accommodation through the AEC. The midterm exams should follow the HW.

Final project
A key part of this course is the opportunity for each student to pursue a final project of their own design. The project should contain some digital component, though there can be analog components if desired. More details will be provided about the final project, final report, tools, equipment, and some ideas later in the term.

You must schedule a time with me to checkout your final project before June 8 and hand in a final project report by June 10. There is no final exam for the course.

Course grade:
Homework (due Mon at start of class): 20%
Lab reports (due Mon at start of class): 30%
Midterm 1 (in class): 15%
Midterm 2 (in class): 15%
Final Project: 20%
At https://canvas.uoregon.edu you may login and access course documents, including this syllabus. The homework, homework solutions, lab assignments, course resources, and class announcements will also be communicated and posted on canvas.

**Student Conduct:**
Mutual respect in class is paramount. Academic Misconduct, as defined in the Student Conduct Code, including cheating, fabrication, facilitating academic dishonesty, and plagiarism, devalues the reputation of our institution, its faculty, its students, and the degrees we offer. Moreover, academic misconduct is particularly unfair for the students who do their work with integrity and honor. Violations of the student conduct code result in the incident being included on your student conduct record and can result in a failing grade on any course work related to the violation or a failing grade in the course. Every effort will be made in this class to deter dishonesty through classroom procedures. Suspected academic dishonesty will be reported.

**Special Accommodations:**
The AEC (Accessible Education Center) exists to help students achieve access to educational resources. If you have a disability but are not registered with AEC, you should contact them as soon as possible (http://aec.uoregon.edu). If you anticipate needing special accommodation in Physics 432 please contact me as soon as possible so we may discuss your situation.

**Important Dates:** (registrar)
- April 2: Last day to drop without a “W”
- April 4: Last day to add a class
- May 15: Last day to withdraw (drop with a “W” and no refund)
- June 8: Final project checkout due
- June 10: Final project report due

**Tentative schedule:**
Note that this schedule is tentative. It will be updated on canvas and announced in class if things change.

### Week 1
- M Mar 28: Binary Numbers
- W Mar 30: Logic Gates

Lab Sign up
Reading: Chapter 9

### Week 2
- M Apr 4: Boolean Algebra
- W Apr 6: K-maps

Lab 1: Binary Numbers and Logic
Reading: Chapter 10

HW #1 due

### Week 3
- M Apr 11: Sequential Logic
- W Apr 13: Multiplexers, Decoders

HW #2 due, Lab 1 due
Lab 2: Multiplexers  
Reading: Chapter 12

Week 4  
M Apr 18  Flip-Flops  
W Apr 20  Midterm in class  
Lab 3: Flip-flops  
Reading: Chapter 13

Week 5  
M Apr 25  Counters  
W Apr 27  State Machines I  
Lab 4: Counters  
Reading: Chapter 13

Week 6  
M May 2  Programmable Logic  
W May 4  Programmable Logic  
Lab 5: Programmable Logic

Week 7  
M May 9  A/D Conversion  
W May 11  A/D Conversion  
Lab 6: ADCs  
Reading: Chapter 16

Week 8  
M May 16  State Machines II  
W May 18  Memories  
Lab: Work on final projects

Week 9  
M May 23  TBD  
W May 25  Midterm in class  
Lab: Work on final projects

Week 10  
M May 30: Memorial day, No class  
W June 1  TBD  
Lab: Work on final projects

 Finals  
W June 8  Final project checkout due  
F June 10  Final project report due