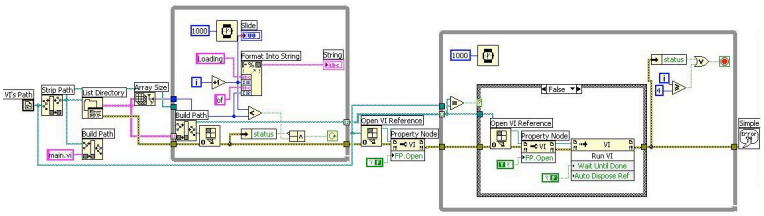
PHY 310 Electronics and Instrumentation



Welcome to PHY 310!

Physics 310 is a laboratory course designed for students majoring or minoring in physics or other sciences who are interested in electronic design, experimental instrumentation and techniques used in physics and other experimental disciplines where inside knowledge of equipment is needed and/or highly beneficial. The main objective of this course is to introduce you to electronic elements and circuits and their function and show how they can be applied in instrumentation and experiments through computer-aided experiment control and data acquisition with the LabView programming environment Although the applications will mainly focus on instruments in physics, the basics of electronics can be applied to a variety of experimental disciplines.

Why Electronics?

Physics is an experimental science. While theory is important for giving us the power of predictability and explanation of experimental outcomes, experiments lead us to new discoveries and can confirm existing theories. Most experiments today include measurements which involve electrical signals. Therefore the knowledge of acquiring, measuring and manipulating signals is essential to any experimental science.

Grading policy

Your Physics 310 grade will be based on quizzes, lab book reports, a project or presentation and participation.

Pre lab Quizzes	15 %
Class work & participation	25 %
Lab reports	45 %
Final Project/Presentation	15 %
Total	**100 %**

STAFF INFO

DR MARIN PICHLER
Instructor
Office: HS-G10 D, Lab: HS-G16
MWF 10:30-11:20 and by appt.
marin.pichler@goucher.edu
(410) 337-6328

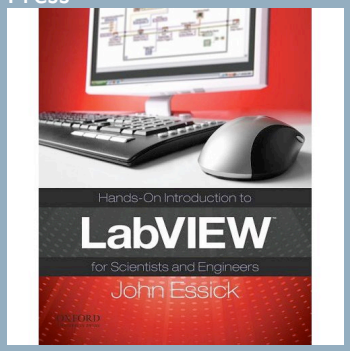
Seymon Ginzburg
Lab Manager
Office: HS-B29
(410) 337-6321

Text:

Instrumentation for Scientists lab manual by Paul Zitzewitz, U. Michigan Dearborn;

Principles of Electronic Instrumentation, by Diefenderfer& Holton, Thompson College Publishing;

Hands-on Introduction to LabVIEW for Scientists and Engineers by J. Essick, Oxford Univ. Press



Lecture/Lab: Tu 1-4 HS-10B
Open Lab hours: M, W 2-3:30

Schedule

Note: Class schedule is tentative and subject to changes.

Week	Topic	Experiment/Project	Reading
1	Overview; Resistive sensors; Resistance to Potential difference	Whetstone bridge project	1A-D3
2	Voltage dividers; Sensors	Oscilloscope review	1E; 2A-B
3	RC Filters	RC Filter Phase project	2C, 2C3
4	Operational Amplifiers	OP-AMPs	3A-B
5	Operational Amplifiers	Photometer project	3B3
6	Diodes and transistors	Light-Wave communications Project	3C; 3C3
7	analog to digital project	ICL8038 oscillator	Ch. 8
	Spring break		
8	Digital Logic	Traffic light project	4A-B; 4B3
9	Sequential Logic; timers	LF555	4C; 4C3
10	ADC and DAC fundamentals	ADC conversion	5A-B
11	Data acquisition: LabView Intro	NI USB-6009	6A-B
12	NI LabView	LabView project	Essick 1,2
13	NI LabView	LabView project	Essick 3, 4
14	NI LabView	LabView project	Essick 5, 8 and partly 6 & 7

Lab Reports

Each topic in our schedule will be followed by lab exercises. The lab book should contain in detail description of the project, measurement procedures, calculations, results and conclusions. All circuits should be included as schematics. Whenever possible, sections on measurements and results should contain graphs.

Lab books will be graded on a weekly basis following each topic. Lab reports are due the following class after the start of the project. Late reports will be subjected to 5% penalty per day.

Pre-lab Quizzes

There will be pre-lab quizzes before each lab session. Since this is a lab course, the quizzes may contain experimental elements.

Class Presentation/Project

You have the choice of doing a presentation on a list of available projects concerning analog or digital electronics, or doing a practical electronic project in the department. Projects should include not just a detailed description of what was carried out, but also a successful demonstration.

Participation/attendance

Attendance in lab sessions is necessary for the completion of the course. It is assumed that you will actively participate in all class activities during all regular lab periods. Participation in lab sessions outside the regular times is possible under special circumstances and with instructors permission. Excused absences may be due to serious illness, family reasons, court appearance and religious observance.

Homework

There are no formal homework assignments for the course, but homework includes preparation for each lab: reading handouts and relevant chapters in the textbook and the lab manual and occasionally any other sources (books, articles in scientific journals or from the web). You need to be familiar with each lab project before coming to class.

Policies

Special Needs/Disability -please contact the ACE: Assistance to Students with Disabilities office to arrange accommodation.

Lateness - try not to be late for class. However if you are late, please come in with as little disruption to the the class as possible.

Absence - It is essential that you to attend all labs. Let me know if you are going to miss a lab. You are responsible for the material that was covered. Excused absences may be due to serious illness, family reasons, court appearance, religious observance and varsity athletic events.

Reminder - you may work together discussing lab projects, but you can not copy someone else's work and data. You are responsible to take the opportunity to learn and master the material we'll be covering. All students are bound by the standards of the Goucher's Academic Honor Code (see www.goucher.edu/documents/General/AcademicHonorCode.pdf).

Cell Phones - the use of cell phones in class/lab is not permitted. If your phone goes off during lectures you'll be asked to leave the lab.

Safety

We will be using AC and DC currents, high voltages and equipment You have to follow all safety instructions and precautions. Failure to do so will endanger yourself and others and can result in dismissal from class.