

**Intermediate Physics Laboratory**  
 PHYS 2129  
 Spring 2023

Lecture: Tuesday/Thursday 1.00 – 1.50 pm  
 Place: Physics Room 202

Laboratory: Tuesday 2.00 – 4.50 pm  
 Thursday 2.00 – 3.50 pm  
 Place: Physics Room 219

Instructor: Jason Summers  
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 Office: 212 Physics

Laboratory Manual: Principles of Electronic Instrumentation (copy).

References: *Principles of Electronic Instrumentation* by A. James Diefenderfer and Brian E. Holton.  
*Basic Electronics: An Introduction to Electronics for Science Students* by Curtis A. Meyer,  
*The Art of Electronics* by Horowitz and Hill

Laboratory Schedule:

Date	Experiment/Assignment	Date	Experiment
Jan 17	Lab 1	Mar 14	Assignment 11
19	Assignment 2	16	Spring Recess
24	Lab 2	21	Lab 11
26	Lab 3	23	Lab 12
Jan 31	Lab 4	28	Spring Break
Feb 2	Lab 5	30	
7	Assignment 6-1	Apr 4	Lab 13
9	Assignment 6-2	6	Lab 14
14	Lab 6	11	Lab 15
16	Assignment 7	13	Lab 16
21	Lab 7	18	Lab 17
23	Assignment 8	20	Lab 18
28	Lab 8	25	Project
Mar 2	Lab 9	27	
7	Midterm Test	To be determined	Final Project
9	Lab 10		

Experiment Report: Every student must turn in his/her report for grading. Each report should be turned in with a cover page (must be printed page) which contains name, name of lab partner(s), title of experiment and date. The cover page should have a short description of the experiment and your conclusions.

Experiment reports must be turned by the date specified in Canvas. Each experiment will be graded at 100 point scale.

Assignments: Special assignments have been created to help prepare for the upcoming laboratory. These include circuit simulations and homework problems. Each will be worth 100 points.

Project Report: The following are the projects to be completed in the last part of this semester. Each completed project will be graded at 100 point scale.

1. Lab-View and interface to your simple circuit.  
- Start by doing Lab-View Tutorial.
2. Construction of a two-digit frequency counter.
3. Low level signal measurements with a thermocouple. Noise reduction and instrumentation amplifier.
4. Use of the data acquisition module for your computer to measure temperature or light level in Room 219.
5. Photodarlington Optical Interrupter
6. Temperature Controller..

These laboratory projects will be different from the follow-the-instruction-in-the-manual type that we do in the first half of the semester. You will get a general description of what your goal is and some suggestions about how to accomplish that goal. Each group of laboratory partners will work out how to do the lab. You can talk with other lab groups but each student is responsible for knowing the why and how of everything.

For this part of the course, each student will keep your own laboratory notebook. For each project, each group submits one written laboratory report (prepared with a word processor; diagrams etc. or can be hand drawn if necessary). I suggest the following be included: Name of project, your name, name of lab partner, date, objectives, procedures, circuit diagrams, data, error analysis, conclusions or results, discussion of difficulties.

Grading Scale: >89.5 % = A  
>79.5 % = B  
>69.5 % = C  
>59.5 % = D

Grade weight: Laboratory reports, Assignments, and Projects: 60 %  
Midterm test: 20 %  
Final Project: 20 %

\*Midterm test will be based on the materials covered in lectures, laboratory experiments and assignments.

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**Lab Experiments and Assignments:**

1. Ohm's Law
2. Kirchoff's Law
3. DC Circuits
4. AC Test Instruments
5. Transient RC Circuits
6. AC Circuits
7. LCR Circuits
8. Diodes I: Rectification and Filtering
9. Diodes II: Zeners
10. DC Power Supplies
11. Transistors
12. Op-Amps I
13. Op-Amps II
14. Circuit Simulation (Multisim is used for each lab experiment)
15. Oscillators
16. Digital Circuits
17. Digital and Analog I/O (I)
18. Digital and Analog I/O (II)

**Projects:**

1. LabView Interface
2. Digital Counting Circuits
3. Measurement by Using Sensor
4. Data Collecting
5. Counter and detector
6. Controlling Circuits