



SYLLABUS

PHYSICS 331 JUNIOR PHYSICS LAB I

FALL 2015

INSTRUCTOR CONTACT INFORMATION

Instructor: Prof. Frank Geurts
Office: Herman Brown Hall 236
Email: geurts@rice.edu
Office Hours: most afternoons, or by appointment

COURSE OBJECTIVES AND LEARNING OUTCOMES

In this laboratory course students will learn basic technologies to undertake work in physical science and analyze their data.

By the end of this course, students have demonstrated the ability to

- Design and prototype simple analog and digital circuits that may be used for data acquisition
- Employ basic noise reduction techniques, including digital signal averaging and lock-in detection
- Configure a simple particle-counting system to obtain specified information
- Utilize more complex computerized data acquisition systems
- Apply appropriate statistical and graphical tools to analyze data

TEXTS AND MATERIALS

The course web page, <http://www.owl.net.rice.edu/~dodds/phys331.html>, contains extensive resources for all the required exercises. The textbook by Bevington, "Data Reduction and Error Analysis" (any edition) is a useful resource for statistics and data analysis. At the end of this syllabus a list of direct links to the topical notes can be found.

Apparatus for all the exercises will be available in the Physics Teaching Lab area in the Brockman Hall of Physics (BHP), room 120. You may obtain the door code from Dr. Geurts in Herman Brown Hall 236. The building is accessible outside of normal hours with a Rice ID.

The experimental work is semi-self-paced, but you must read the relevant safety notes before beginning experimental work. At the start of each new experiment you are expected to join an introductory class in which the materials for each exercise are reviewed. Reviewing the experimental set up with the instructor will save you the time and wasted effort otherwise spent chasing parts or malfunctions. In the event that problems arise in the course of your work, get help from the instructor. You are not expected to solve all possible problems on your own.

REPORT DEADLINES

The graded work for the semester will consist of:

- A report on the Analog Circuits exercise: due by 5:00 PM Monday September 14, 2015
- A report on the Digital Circuits exercise: due by 5:00 PM Monday October 5, 2015
- The Data Analysis exercise: pledged problem set available for pickup from HBH 236 Tuesday October 6, 2015; due by 5:00 PM Friday October 16, 2015.

- A report on the Noise Reduction exercise: due by 5:00 PM Monday November 9, 2015
- A report on the Particle Counting Exercise: due by 5:00 PM Tuesday December 8, 2015

In order to complete the course you should plan to work at least one afternoon per week, preferably on a regular schedule. The deadlines define a minimum pace for successful completion of the course. Note also that the amount of equipment is limited, so it will be impossible for all students to do an experiment immediately before a deadline.

GRADE POLICIES

Early submissions are always welcome, while late work will be penalized at the rate of 5 percentage points per day late. Reports and problem sets will not be accepted more than 10 days after the due date or the end of finals, whichever is earlier. All assignments must be completed in order to pass the course.

RICE HONOR CODE

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at <http://honor.rice.edu/honor-system-handbook/>. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

DISABILITY SUPPORT SERVICES

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

SYLLABUS CHANGE POLICY

This syllabus is only a guide for the course and is subject to change with advanced notice.

TOPICAL NOTES

- [Safety Notes](#)
- [Digital Circuits](#)
- [Analog Circuits](#)
- [Making Circuits Work](#)
- [Dimensions, Units and Conversions](#)
- [Error Analysis and Significant Figures](#)
- [Using Figures - The Basics](#)
- [Graphing Examples](#)
- [Plotting Data With Microsoft Excel](#)
- [Noise Reduction](#)
- [Particle Counting Methods](#)
- [Particle Counting Statistics](#)
- [Operation of NIM Modules](#)
- [Additional Sources](#)

COURSE SCHEDULE

Week 1	Analog Circuits	
8/24	Review of Analog Circuits materials (120 BRK at 4pm)	
Week 2		
8/31		
Week 3		
9/7		
Week 4	Digital Circuits	
9/14	Review of Digital Circuits materials (120 BRK at 4pm)	Due date for report on Analog Circuits (4pm)
Week 5		
9/21		
Week 6		
9/28		
Week 7	Data Analysis and Presentation	
10/5	Review of Data Analysis and Presentation materials (120 BRK at 4pm)	Due date for report on Digital Circuits (4pm)
10/6	Pledged problem set available for pick-up	
Week 8		
10/16		Due date pledged problem set (4pm)
Week 9	Noise Reduction	
10/19	Review of Noise Reduction materials (120 BRK at 4pm)	
Week 10		
10/26		
Week 11		
11/2		
Week 12	Particle Counting	
11/9	Review of Particle Counting materials (120 BRK at 4pm)	Due date for report on Noise Reduction (4pm)
Week 13		
11/16		
Week 14		
11/23	(Thanksgiving Recess 11/26-27)	
Week 15		
11/30		
12/8		Due date for report on Particle Counting (4pm)

