

# PHY353 MODERN PHYSICS LABORATORY - Spring 2017

**Class Meetings:** Unique number 56905 MW 2:00-5:00 PM, 56895 TTh 8:00-11:00 AM, and 56900 TTh 2:00-5:00 PM. The lab room is RLM 7.302. There will be a weekly lecture common to all 3 sections, on Mondays from 9:00-10:00 in RLM 7.104.

**Instructor:** Greg O. Sitz, Office: RLM 10.313, Office Hours: Th 1:00-2:00, F 10:00-11:30 or by appointment. Phone: 471-0701, email: [gositz@physics.utexas.edu](mailto:gositz@physics.utexas.edu)

## Teaching Assistants:

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**Prerequisites:** PHY315, Wave Motion and Optics. Credit for PHY355 is recommended but not required.

**Brief Description:** This class is intended to help you develop the ability to perform more involved experiments and to write up the results in a coherent, complete manner. Emphasis will be placed on laboratory techniques, measurement analysis including error analysis, and effective presentation. The physics topics are drawn from the set of 'non-classical' topics, that is related to quantum phenomena, special relativity and the atomic structure of matter.

**Resources** - The text is *Experimentation*, by Baird. This is a generally useful book for data analysis and report preparation. There are many similar books that cover the same material, so this book is not required. However, you will want some such book at your disposal and this is a good one.

The PMCL down the hall from the lab has a number of software packages installed that you can use for data analysis and report preparation. These include: Mathematica, GnuPlot, MatLAB, KaleidaGraph, a LaTeX package, as well as the complete Microsoft Office. Some tutorials, a LaTeX report template and a guide to report writing will be placed on the Canvas site. Generally, you are free to use whichever software you like to do data analysis and report preparation. There is one exception: no Excel graphs!

A detailed document dealing with data analysis and report preparation prepared specifically for this lab can be found in the Files section on Canvas, filename `skillmanual.pdf`

A short introduction to the GnuPlot plotting program can be found in the Files section on Canvas, filename `GnuPlot_Primer.pdf`

All of the material associated with the PHY110C student led seminar also covering data analysis and report preparation can be found at

<http://www.evanott.com/data-analysis/>

Background information of the individual experiments are found at

<http://www.ph.utexas.edu/~phy3531>

The username is `phy3531` and the password is `juniorlab` This site will be your primary resource in selecting and performing experiments.

**Grading** - The breakdown is:

- Written Lab Reports 70 points
- Oral Exam 6 points

- data analysis problem set 8 points
- Oral Presentation 6 points
- lab/lecture participation (TA and instructor evaluation) and lab book 10 points

**Written Reports:** There will be five written lab reports plus a practise data analysis problem set. The grade scale will be provided when the first lab report is returned. The due dates for reports are on the lab calender. Your reports will be submitted electronically and details on how to do this will be provided. Reports that are between 1 minute and 24 hours late will be accepted with a 10% penalty. Reports that are between 24 and 48 hours late will be accepted with a 20% penalty. Reports more than 48 hours late will be accepted only after a explicit agreement with the instructor. If you get behind on your reports it is extremely difficult to catch up.

The choice of labs and the order you do them are largely up to you. Generally, you will work in groups of two with occasional exceptions. Note that only one group in a given section can be doing a particular experiment during a given week, so look over the available labs and sign up promptly for the ones that interest you.

**Data Analysis Homework:** The data analysis problem set is available on Canvas in the Assignments section.

**Oral Exam:** You will be required to have an oral report on one lab. This is in addition to the written report on the same lab as detailed above. Oral reports are to be 15 minutes (rigorously enforced) in length and will be conducted during the weeks of March 27 through April 6 over lab 2 or 3 (your choice). These will be one-on-one with the instructor. Examinations will be scheduled using the Canvas calendar and you must sign up for by Thursday, March 9.

**Oral Presentation:** You will be required to give an oral presentation on one lab. This is in addition to the written report on the same lab as detailed above. Oral presentations are to be 15 minutes (rigorously enforced) in length and will given in lab during the last week of classes. Presentations will be scheduled using the Canvas calendar and you must sign up for by Friday, November 19.

**Lab Book:** You are required to have a lab notebook. This must be bound and not loose pages. You should develop the habit of writing in your notebook. A lot. Diagrams and sketches are viewed with particular favor. The TA's will be periodically be checking your notebook and this will be part of your participation points.

**Other:** The last date to drop the course with a possible refund is February 1, 2017. Last day a student may drop a class is April 3, 2017.

If you are absent for the observance of a religious holy day you may complete the work missed within a reasonable time after the absence, if proper notice has been given. Notice must be given at least seven days prior to absence.

The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY.

**Writing Flag:** This course carries the Writing Flag. Writing Flag courses are designed to give students experience with writing in an academic discipline. In this class, you can expect to write regularly during the semester, complete substantial writing projects, and receive feedback from your instructor to help you improve your writing. You will also have the opportunity to revise one or more assignments, and you may be asked to read and discuss your peers work. You should therefore expect a substantial portion of your grade to come from your written work. Writing Flag classes meet the Core Communications objectives of Critical Thinking, Communication, Teamwork, and Personal Responsibility, established by the Texas Higher Education Coordinating Board.

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### List of Labs

Radioactive Decay* (2/2)	Semiconductors* (2/3)
Electron Diffraction* (2/3)	Speed of Light (Pulsed laser)* (1/1)
Blackbody radiation* (1/4)	Franck-Hertz* (1/2)
Hydrogen-Deuterium* (1/1)	Solar Spectra* (1/3)
Ramsauer-Townsend* (1/2)	Photoelectric Effect* (3/4)
LED* (1/3)	Chaotic Dynamics (4/4)
High Tc Superconductivity* (1/3)	Relativistic Dynamics* (2/3)
Ideal Gas Law* (2/3)	Gamma-Gamma Coincidence (5/2)
Double Slit Interference (3/2)	Half Life* (3/1)
Oil Drop and Charge Quantization (4/3)	Brownian Motion (3/4)
Speed of Light (Rotating Mirror) (5/2)	Pulsed NMR (5/4)
Mie Scattering (4/5)	Positronium Lifetime (5/4)
- Your chance for immortality (6/6)	

Subjective ratings are given (experiment/writeup, 1-easy to 5-hard).  
Labs that have a \* are suitable for the first lab.

### Quotes

“You do not know anything until you have practiced” -R. P. Feynman

“How often have I said to you that when you have eliminated the impossible, whatever remains, however improbable, must be the truth?” - Sherlock Holmes (Sir Authur Conan Doyle)

“Reality is that which, when you stop believing in it, doesn't go away.” - Phillip K. Dick

### **ACHTUNG!**

ALLES TURISTEN UND NONTEKNISCHEN LOOKENPEEPERS!

DAS KOMPUTERMASCHINE IST NICHT FR DER GEFINGERPOKEN UND MITTEN-GRABEN! ODERWISE IST EASY TO SCHNAPPEN DER SPRINGENWERK, BLOWEN-FUSEN UND POPPENCORKEN MIT SPITZENSPARKEN.

IST NICHT FR GEWERKEN BEI DUMMKOPFEN. DER RUBBERNECKEN SIGHTSEEREN KEEPEN DAS COTTONPICKEN HNDER IN DAS POCKETS MUSS.

ZO RELAXEN UND WATSCHEN DER BLINKENLICHTEN.

## PHY353 MODERN PHYSICS LABORATORY - Spring 2017 Calendar

Monday	Tuesday	Wednesday	Thursday
January 16	17	18	19
MLK Day	No Lab	No Lab	No Lab
January 23	24	25	26
Equipment bootcamp	Equipment bootcamp	Lab 1 Sign up Equipment bootcamp	Lab 1 Sign up Equipment bootcamp
January 30	31	February 1	2
Start Lab 1	Start Lab 1		Outline uploaded by 11:59 PM
February 6	7	8	9
End work on Lab 1 Sign up for Lab 2	End work on Lab 1 Sign up for Lab 2	Report Workshop Sign up for Lab 2	Report Workshop Sign up for Lab 2
February 13	14	15	16
Start Lab 2 Lab 1 due at 12:01 AM	Start Lab 2 -		
February 20	21	22	23
		End work on Lab 2 Sign up for Lab 3	End work on Lab 2 Sign up for Lab 3
February 27	28	March 1	2
Start Lab 3 Lab 2 due at 12:01 AM	Start Lab 3 -		
March 6	7	8	9
		End work on Lab 3 Sign up for Lab 4	End work on Lab 3 Sign up for Lab 4
March 13	14	15	16
Spring Break	Spring Break	Spring Break	Spring Break
March 20	21	22	23
Start Lab 4 Lab 3 due at 12:01 AM	Start Lab 4 -		
March 27	28	29	30
April 3	4	5	6
		End work on Lab 4 Sign up for Lab 5	End work on Lab 4 Sign up for Lab 5
April 10	11	12	13
Start Lab 5 Lab 4 due at 12:01 AM	Start Lab 5 -		
April 17	18	19	20
		End work on Lab 5	End work on Lab 5
April 24	25	26	27
3 minute previews Lab 5 due at 12:01 AM	3 minute previews	Presentations	Presentations
May 1	2	3	4
Presentations	Presentations	Presentations	Presentations