

**UNIVERSITY OF PUERTO RICO RIO PIEDRAS CAMPUS
DEPARTMENT OF PHYSICS**

**FISI 4076: INTERMEDIATE PHYSICS LAB
FISI 4077: ADVANCED PHYSICS LAB**

1. General information:

Course Code: FISI 4076

Credit: 2

Class hours: Tuesday 2:30pm-5:20Pm
Thursday 2:30pm-5:20pm

Class Room: C 340

Professor: Dr. Ratnakar Palai

Office: FB 219 Facundo Bueso Bldg

Email: r.palai@upr.edu

Telephone: 787 764 0000 Ext: 4773

Office hour: Friday 4:00pm-5.00 pm, FB219 Facundo Bueso Bldg.

Teaching Assistant: Mr. David Gonzalez

Email: david.gonzalez5@upr.edu

2. Syllabus:

The Intermediate Physics Lab (IPL) and Advanced Physics Lab (APL) will introduce you to several modern experimental techniques in many physical disciplines, such as optics, electronics, atomic and nuclear, physics, solid state physics, electromagnetism, semiconductor physics, quantum mechanics, etc. You will be responsible to for making scientific experiments and verify them by analyzing you observed data. It is very important that you understand the errors on your data.

3. Experiments:

FISI 4076: Intermediate Physics Lab (IPL)

1. Photoelectric effect (2 ways)
2. Atomic Spectra
3. Millikan Oil drop Experiment
4. Velocity of Light
5. Rutherford Scattering
6. Frank-Hertz Experiment
7. Nuclear Physics- α , β , and γ decay –(13 Experiments)
8. Bragg Diffraction (microwave)
9. Fiber Optics
10. Microwave Optics- (12 Experiments)

FISI 4077: Advanced Physics Lab (APL)

1. Electron Spin Resonance

2. Hall effect
3. Ferromagnetic Hysteresis loop
4. Four-probe Resistivity measurement
5. Superconductivity
6. Current-Voltage characteristics of LEDs
7. Electromagnetism
8. Light Emitting Diode (LED)

4. Course Objectives

- To get hands-on experience in using different modern physics experiments
- To broaden the understanding of fundamental physics
- To understand how to characterize semiconducting and magnetic materials

5. References:

- G.L. Squires, Practical Physics (Cambridge, 1987).
- D.C. Baird, Experimentation, 2nd ed. (Prentice Hall, 1988).
- P.R. Bevington, Data Reduction... (McGraw-Hill, 1969). Valuable reference for practical error analysis and curve fitting. Somewhat esoteric on the philosophic underpinnings.
- L. Lyons, Data Analysis.(Cambridge, 1991).

6. Course requirements:

Procedures:

Work with one lab partner, normally the same one throughout the semester. Record all your data in your own lab notebook (**bound Lab notebook**) during the experiment. Describe briefly description of the apparatus (not just the name of the apparatus) and procedure in your own language. Find out the precision of all the measurements by repeating two to three times. Leave some space for data tabulation, calculation, interpretation, and summary.

Experiments:

You have to do **five experiments** and **one project** to complete the course. You are required to submit a lab report and give brief oral presentation at the end of the experiment and project. The selection of the experiments and project should be done in consultation with professor and TA. The experiment selection should be balanced with duration and diversity of the experiments. You can discuss with the professor/TA to check the availability and suitability of the experiment you are considering.

Do enough reading about the experiment prior to do it for the better understanding of the experiment. Once you finished an experiment, plot graphs using your data and meet individually with the professor/instructor/TA to discuss your results (bring your notebook).

Pay attention to the suggestions the instructor/TA may have on analysis and interpretation you include in your final report.

Reports:

You are required to submit a lab report (4-5 pages for the experiment and 5-10 pages for the project) at the end of the experiment and project before the **deadline through “UPR Moodle”**. **The Moodle will NOT allow to submit after the deadline (before the class)**. In addition, you should prepare to a short (5-10 min) oral presentation on your experiment and 30 min for project (**what you did, what the results were, and what conclusion can be drawn**) using power point.

The report is due on the next lab period after you finished the experiment or by the deadline. The most important thing the instructor will look for qualitative and quantitative information you are able extract from your experiment and quality and clarity of the writing. The report and presentation will be graded on a scale of **10 point**. **Late penalties of 1 points/week will be deducted from the total point.** We encourage early submission. If the report is not satisfactory and you can revise and resubmit by the deadline but the **revised report will get maximum of 1 point from previously obtained points.**

The final grade will be assigned by adding all the points up obtained in experiment, project, and lab performance (sincerity, equipment maintenance, punctual, lab safety, etc.). The total grade point is distributed as follow.

Grade Point Distribution	
Experiment + Presentation	70%
Project +presentation	20%
Lab Performance	10%

Format of the Lab Reports: The following is the stand Lab report format

- i. Aim of the experiment--- clear and concise
- ii. Apparatus required--- brief description of the apparatus used
- iii. Theory - Principle behind the experiment
- iv. Results and discussion- Tabulation, calculation, and interpretation
- v. Error Analysis
- vi. Conclusion—brief summary of the experiment
- vii. References

Course Grading:

The final grade will be assigned by adding all the points up obtained in all the three sections.

Grade Scale out of 100 points	
Total points	Letter Grade
≥ 90	A
≥ 80	B
≥ 70	C
≥ 60	D
< 50	F

Lab report expected deadlines: Please check Moodle for final deadline

Report #	Deadline
First	4 th Sept. 2018
Second	18 th Sept. 2018
Third	2 nd Oct. 2018
Fourth	16 th Oct. 2018
Fifth	6 th Nov. 2018
Project	28 rd Nov. 2018

6. Special requirements:

Students with disabilities needing academic accommodations should register with, and provide documentation to the Department of Physics and bring me a copy stating that your needed academic accommodations. Please do this during the first week of class. For more information, contact Department of Physics.

Name:-----

Student ID:-----

Report #	Point/10	70%	Total Point	Final Grade
1st report				
2 nd Report				
3 rd Repot				
4 th report				
5 th report				
Project		20%		
Lab performance		10%		