Physics Department, University of Puerto Rico, Rio Piedras Campus

PHYS 4049 Electronics

Lab: **PHYS 4049**
Place: CNL C - 334
Date: Friday
Time: 8:30am –11:30am

Lecturer: Dr Peter Feng
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Course Syllabus

    This is a very interest course. In this course, we will study Electronic Circuits and Measurements techniques in **theory, computer simulation, and experiments**. It will include a study of digital and analogy electronics with emphasis in their application to circuit design of experimental set-ups, elements of semiconductor physics, diode and transistor operation and circuits, operational amplifiers, digital gates, flip-flops and timing circuits. Student will learn to design new experimental set; assemble experimental components; learn how to observe physics phenomena and measure physics parameters; learn data processing and explanation of results. Students will also study how to write experimental reports.

    The course will consist of lectures and laboratory experiences where concepts learned in class will be demonstrated and explored. The purpose of the course is to provide a fundamental proficiency in Electronic Circuits and Measurements techniques

Textbooks: **Modern Instrumentation for Scientist and Engineers**: J A Blackburn, Springer-Verlag, New York, 2001, ISBN 0-387-95056-7
An introduction to Modern Electronics, Willian Faissler
John Wiley & Sons, Inc 1991 ISBN0-471-62242-7
Physics for scientists and Engineers, Modern Physics, General Physics, Manual Fundamentals of physics by Halliday, Resnick, Walker, John Wiley & Sons Inc, ISBN 0-471-22861-1

References: 1 Analog and digital electronics for scientists: Basil H Vassos and Galen W Ewing John Wiley & Sons Inc. New York 1985
2 Basic digital electronics with MSI applications: John A Dempsey Addison-Wesley Publishing Company, California 1979
3 Experimentation with digital electronics: John A Dempsey Addison-Wesley Publishing Company, California 1977
4 Advanced Labview Labs, John Essick, 1999 PRENTICE-HALL, Inc Simon & Schuster/A Viacom Company, ISBN 0-13-833949-X

Note: The textbook will be amply supplemented with handouts as the course progresses. Electronic version of lecture notes can be found in computers in laboratory.

Contents (1, Theory, 2, Computer simulation, and 3, Experiments)

[1]   Basic concept for AC and DC circuits
[2]   Elements of semiconductor physics,
[3]   Diode and its application in power supply
[4]   Transistor operation, circuits, and applications
[5]   Operational amplifiers, and various applications
[6]   Digital gate,
[7]   Timing circuits, and applications
[8]   Digital and analogy electronics with emphasis in their application to circuit design
[9]   Arduino

Week	Topic
1	Introduction
	Review: PC, PB-503 analog/digital proto-board,
2	oscilloscopes, multi-meter, applications
	Review simple DC and AC circuits,
3-5	complex DC and AC circuits
	Bridge experiment and calculation
	Computer simulations, experiments,
6-10	Basic theory for semiconductor
	diode, its application in power supply
	(theory, computer simulation and experiment)
	Power supply devices
	(theory, computer simulation and experiment)
	Transistor (basic mechanism and application)
	(theory, computer simulation and experiment)
	OP-AMP circuits
	(theory, computer simulation and experiment)
11	Make up/1st Presentation/1st Quiz/ Practice
12-15	Introduction to Logical electronics
	Logical integrated circuits, combinational logic
	Karnaugh Map simplification.
	Experiments: PC simulation
	construct the combinational logic circuit (Theory, Experiments: PC simulation)
	Logical MATH (Theory, Experiments: PC simulation)
16	Digital gates, flip-flops and 555 IC based timing circuits
	flip-flops-based logical device.
17	DC & AC digit and DC & AC measurements
	Design and assemble 32 channels DMM
18	Arduino
19	Ardunio based projects
20	Make up/2nd Quiz/ Practice

Grade Assignments:
The Final grade will be based on the following: Experiments (30%), Lab Reports/presentations (40%), Projects (30%)

Grade/Scale : 90-100% (A), 80-89.9% (B), 70-79.9% (C), 60-69.9% (D), 0-59.9% (F)

Right of students with disabilities. UPR complies with all federal and state laws and regulations regarding discrimination, including the Americans with disabilities Act 19990 (ADA) and the commonwealth of Puerto Rico Law 51. Students receiving service through Rehabilitation Vocation must contact the professor as the beginning of the semester in order to plan for a reasonable accommodation and any required support equipment according to the recommendations given by the Officina de Asuntos para Persons com Impedimentos (OAPI) of the Dean of students. Likewise, student with special need that require some type of accommodation must contact the professor at the beginning of the semester.

Rights of Students with Disabilities:
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REGULATION ON DISCRIMINATION BY SEX AND GENDER IN THE FORM OF SEXUAL VIOLENCE:
"The University of Puerto Rico prohibits discrimination based on sex, sexual orientation, and gender identity in any of its forms, including that of sexual harassment. According to the Institutional Policy Against Sexual Harassment at the University of Puerto Rico, Certification Num. 130, 2014-2015 from the Board of Governors, any student subjected to acts constituting sexual harassment, must tum to the Office of the Student Ombudsperson, the Office of the Dean of Students, and/or the Coordinator of the Office of Compliance with Title IX for an orientation and/or a formal complaint. "

REASONABLE ACCOMMODATION:
The University of Puerto Rico complies with all state and federal laws and regulations related to discrimination, including "The American Disabilities Act" (ADA law) and Law #51 from the Puerto Rico Commonwealth (Estado Libre Asociado de Puerto Rico). Every student has the right to request and receive reasonable accommodation and Vocational Rehabilitation Services (VRS). Those students with special needs that require some type of particular assistance or accommodation shall explicitly communicate it directly to the professor. Students who are receiving VRS services shall communicate it to the professor at the beginning of the semester so that appropriate planning and the necessary equipment may be requested according to the Disabilities Persons Affairs Office (Oficina de Servicios a Estudiantes con Impedimentos –OSEI) from the Students' Deanship office. Any other student requiring assistance or special accommodation shall also communicate directly with the professor. Reasonable accommodations requests or services DO NOT exempt the student from complying and fulfilling academic and course related requirements and responsibilities.

ACADEMIC INTEGRITY:
The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.

To ensure user data integrity and security, hybrid and distance education courses are offered through the institutional learning management system, which employs secure connection and authentication protocols. The system authenticates the users' identity with the username and password of their institutional accounts. Users are responsible for keeping their password secure and not sharing with others.