Physics 357 – Advanced Instrumentation in Experimental Physics (3)
Course Outline

PHYS 357 Advanced Instrumentation in Experimental Physics (3)
Advanced analog and digital electronics, computer interfacing to experiments, robotics. 2 lectures, 1 laboratory. Prerequisite: PHYS 206 and PHYS 256.

Learning Objectives and Criteria:
Upon completion of the course the student is expected to have the following skills:
--Ability to conceive of and design electronic circuits for a specific purpose.
--Construct functioning electronic circuit based on circuit specification.
--Demonstrate use of computer interfacing for signal input/output and control
--Construct circuits and program them to be run autonomously using a microcontroller.
--Design and build a circuit/control system that employs elements of robotics.

Text and References:
"LabView" by Essick, "Electronic Sensors, Circuits, and Projects" by Mims, "Arduino Cookbook" M. Margolis

Content and Method:
Method: Physics 357 is offered in a traditional lecture and lab format.

Content: Physics 357 will adhere to the following topics:

(See course description above, in addition to LabView programming, microcontrollers.)

Laboratory Projects (typical):
- "Interfacing circle": input/decision/output (including elements of robotics)
- Long-term data taking and intepretation: use a microcontroller to autonomously record data from environmental sensor over long term. Interpretation of data in terms of physical principles and phenomena.
- Final project: Students are given the opportunity to seek out a project of interest that touches on the themes of the course. These projects will likely include some combination of: amplifiers, environmental parameter detection (light, sound, temperature, humidity, light, gas concentration, electric/magnetic fields, etc.), signal processing, Arduino and Mindstorms programming, LabView, robotics.

Methods of Assessment:
The student's course grade is determined by performance on examinations/quizzes and completion of projects (typically three) completed during the quarter. The projects will be evaluated based on laboratory notebooks and video documentation. The lab is run in an "electronics studio" mode, where students are evaluated on their electronics prowess and ability to bring a project to completion. Additional factors included will be directed LabView programming assignments, circuit analysis homework assignments, lab work, and possible reports.