PROJECT GOALS

- Provide an opportunity to relearn concepts underlying common modern physics experiments they had completed one or two years prior to taking this class.
- Create a context in which students apply newly acquired knowledge and skills in:
  - design, simulation, building and testing of electronic circuits that are commonly used in electronic instrumentation.
  - programming using LabVIEW™ to control instruments, collect, analyze and display data and control instrumentation.
- Enable students to see how their learning experiences across various classes connect to and reinforce each other.

PROJECT FRAMEWORK

Sophomore Year

1st semester

Modern Physics Lab (MPL)

2nd semester

Advanced Physics Lab (APL)

Junior / Senior Year

2nd semester

Physical Measurement & Instrumentation (PMI)

Capstone projects in PMI provide a context in which students revisit experiments in MPL and APL and design electronic instrumentation and analysis software using LabVIEW™

EXAMPLES OF CAPSTONE PROJECTS

Saturated Absorption

Physics Goals: Understanding...
- saturation spectroscopy in Rubidium.
- mechanism underlying reduction in absorption.
- principles underlying a Michelson interferometer.

Instrumentation Goals: Using LabVIEW™ to
- control the diode laser.
- collect interferometer and absorption photodetector voltages.
- import data acquired by computer into an Excel-compatible spreadsheet for analysis.

Frank Hertz

Physics Goals: Understanding...
- the reasons for quantization of energy levels of gas atoms.
- how to detect and compute these levels from a measurement of tube current.

Instrumentation Goals: Learning how...
- analog-to-digital conversion can be used in order for a computer to read and control analog voltages to control an experiment.
- to write a LabVIEW™ program to read in the amplified tube current.

STUDENT FEEDBACK

Rate the following aspects of the capstone project experience:

- Increasing interest in experimental physics
- Increasing interest in instrumentation
- Improving circuit building skills
- Improving LabVIEW skills
- Helping learn relevant physics

Student Comments:
- “I liked that it related back to something we did in Advanced Phys. Lab.”
- “I enjoyed the freedom we were afforded to explore our own solution. Even though the TA knew his method would work, he allowed us to devise our own project!”
- “I liked the open-endedness of it. I enjoy being a self-starter, so this was great for me.”
- “The time was short for our project to be completed by the time we presented it.”
- “It was difficult to get everyone to work a decent amount and impossible for everyone to work simultaneously.”