Sensors and Instrumentation Laboratory

Sensors and Instrumentation lab gives students in Electrical Engineering a hands-on introduction to the fundamental technology and practical applications of sensors. Capacitive, inductive, optical, ultrasonic and other sensing methods are examined. Instrumentation techniques incorporating computer control, sampling, data collection and analysis are reviewed in the context of real-world scenarios. Open-ended laboratory activities help to develop students' analytical and communication skills.

This lab features state-of-the-art equipment and software from National Instruments. In this lab, students conduct experiments that teach them the physical properties of most sensors used today and the techniques and limitations of their applications. It features four digital sensors: push button, single-pole double-throw (SPDT) microswitch; transmissive optical switch; reflective optical switch; and magnetic Hall Effect switch. It also features six analog sensors: potentiometer, optical analog distance, magnetic analog field, pressure, temperature, and piezo film. LabVIEW is used as graphical programming language to run different sensors applications.

Experiments

HELEx

- Solar energy: light to electricity
- Electrolyze: water to gases
- Hydrogen fuel cells: gases to electricity

Mechatronic sensor kit

- Benefits and drawbacks of certain sensors
- Sensor behavior
- Calibration
- Using sensors to identify natural frequency of material
- Need for debounce in switches and buttons
- Understanding how encoders work

Major Equipment

- NI Solar-Hydrogen Electricity Experimenter Trainer Board
- NI Mechatronic Sensor Trainer for Instrumentation
- Vernier Sensor Kits
- List of components on the QNET-MECHKIT:
  - Strain gauge to measure deflection
  - Piezo film sensor to measure vibration
  - Rotary potentiometer to measure position
  - Pressure and thermistor sensors
  - Long range sensors: sonar and infrared
  - Short range sensors: magnetic field and optical
  - Encoder
  - Micro switch, optical switch and push button
  - Two light emitting diodes (LEDs)

Mechatronics Sensors Trainer