

School of Management, Engineering and Technology
Department of Electrical Engineering and Renewable Energy
REE 463: Energy Systems Instrumentation & Control

Catalogue Description (2009/2010):	Application of electrical and mechanical sensors, data acquisition and logic controllers as applied to energy systems. Determination of physical parameters necessary for control and data-logging. Methods of calibration and correction. Lab projects employ programmable logic controllers.
Hours/Credits: (Lecture-Lab-Total)	(2-3-3)
Class Schedule:	One weekly 110 minute lecture, one term
Lab Schedule:	One weekly 170 minute lab, one term, corequisite with lecture
Prerequisites:	EE 321
Required Text:	A.J. Wheeler and A.R. Ganji, "Introduction to Engineering Experimentation," 2nd Edition, Pearson Prentice Hall, 2004
Reference Text:	None.
Course Coordinator:	Frank Rytkonen
Regular Instructors:	Frank Rytkonen, Kimberly Wang
Course Objectives - Lecture:	<p>Upon completion of the lecture, a student should be able to:</p> <ul style="list-style-type: none"> • Describe general characteristics of measurement systems • Analyze and design electrical signal conditioning and transmission systems • Explain characteristics of digital measurements • Analyze measurement data using Fourier methods and select appropriate sampling rates • Perform statistical analysis of measurement data • Determine the uncertainty in a measurement • Explain the operating principles of various types of sensors, including but not limited to: temperature, pressure, level, flow, and power
Course Objectives - Lab:	<p>Upon completion of the lab, students should be able to:</p> <ul style="list-style-type: none"> • Develop design documentation for an instrumentation system (e.g., loop drawings, data sheets, installation details) using CAD • Apply instruments to measure quantities associated with renewable energy systems, including but not limited to: temperature, pressure, flow, level, power, and final elements • Use data acquisition (DAQ) hardware & software to acquire, manipulate, analyze, display, and archive measurements • Use programmable logic controllers (PLC) to acquire and manipulate measurement data and human machine interfaces (HMI) to display and archive it
Topics Covered:	<ul style="list-style-type: none"> • Data acquisition for measurement and control • Probability and statistics for measurement • Uncertainty analysis • Sensors for pressure, temperature, flow, level, and power measurement • Instrumentation system design, including documentation development
Relevant Program Outcomes:	<p>(a) an ability to apply knowledge of mathematics, science, and engineering (b) an ability to design and conduct experiments, as well as to analyze and interpret data (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</p>

	(d) an ability to function on multi-disciplinary teams (e) an ability to identify, formulate, and solve engineering problems (g) an ability to communicate effectively (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice		
Required or Elective:	Required		
Criterion 5:	Engineering Topics		
Prepared By:	Frank Rytkonen	Updated:	5/7/10