

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: ESET-271 Department: ESET.AS  
Course Title: Instrumentation & Measurement Semester: Spring Year: 2008

Objectives/Competencies

Course Objective	Competencies
1. Understand basic measuring principles.	<ul style="list-style-type: none"><li>a. Be able to calculate using significant figures.</li><li>b. Be familiar with metric units and prefixes.</li><li>c. Be familiar with quantities expressed in volts, amps, ohms, mhos and decibels.</li><li>d. Be able to confidently convert between units of measure.</li><li>e. Understand the concepts of voltage measurement.</li><li>f. Understand the concepts of current measurement.</li><li>g. Understand the concepts of resistance measurement.</li><li>h. Understand the loading effects of voltmeters, ammeters and oscilloscope.</li></ul>
2. Understand the basic theory and practical application of common sensors and transducers used in measurement.	<ul style="list-style-type: none"><li>a. Be able to use thermistors</li><li>b. Be able to use strain gauges</li><li>c. Be familiar with common opto-electronic devices</li><li>d. Be familiar with opto-isolators</li></ul>

Course Objective	Competencies
<p>3. Understand mechanisms that can effect proper or accurate measurements.</p>	<ul style="list-style-type: none"> <li>e. Be familiar with Hall effect components</li> <li>f. Be familiar with humidity/moisture measurement devices.</li> <li>g. Understand balanced and unbalanced measurement circuits.</li> <li>h. Understand single-ended and differential signal types.</li> <li>i. Be confident in the ability to research new devices that will appear.</li> <li>j. Understand the operation of sonic and ultra-sonic devices.</li> <li>k. Have a basic theory involved in common imaging techniques: digital photography, X-Ray, ultra-sonography, MRI.</li> <li>l. Understand DAC and ADC processes.</li> <li>m. Understand sampling theory.</li> </ul> <ul style="list-style-type: none"> <li>a. Understand meter loading.</li> <li>b. Differentiate between contact and non-contact measuring techniques.</li> <li>c. Understanding the concept of buffering and/or isolation.</li> <li>d. Understand common sources of RFI and EMI noise.</li> <li>e. Understand proper shielding techniques and why they are necessary.</li> <li>f. Understand sources of "human error".</li> <li>g. Understand measuring accuracy specified on lab equipment.</li> <li>h. Understand the need for calibration.</li> <li>i. Be aware of calibration standards.</li> <li>j. Be able to follow manufacturer's documentation to</li> </ul>

<b>Course Objective</b>	<b>Competencies</b>
4. Understand proper operation of typical measuring equipment.	perform automatic self-test/calibration techniques. k. Understand how the surrounding environment can effect the measurement. l. Understand the operation of differential and instrumentation amplifiers.  a. Know how to properly use a Voltmeter to measure AC and DC volts. b. Know how to properly use an Ammeter to measure AC and DC current. c. Understand 2-wire resistance measurement. d. Understand 4-wire resistance measurement e. Understand the fundamental operation of a dual channel oscilloscope. f. Understand the operation of the vertical channels (voltage) of an oscilloscope. g. Understand the horizontal (time-base) functions of a standard oscilloscope. h. Understand the relationship between period and frequency. i. Understand peak, average, RMS and peak-to-peak units. j. Understand and use decibel measurement.