

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

**ACADEMIC AFFAIRS**

Course Number: ENGY 110 Department: Energy Systems Technology

Course Title: Theory of Controls Semester: Spring Year: 1997

**Objectives/Competencies**

<b>Course Objective</b>	<b>Competencies</b>
1. To examine the concepts of basic electrical theory.	<ol style="list-style-type: none"><li>1. Be able to explain the make-up of atoms.</li><li>2. Describe electrical charges.</li><li>3. Describe static electricity.</li></ol>
2. To explore the fundamentals of magnetism as it applies to electricity.	<ol style="list-style-type: none"><li>1. Explain movement of electrons.</li><li>2. Explain positive and negative charges.</li><li>3. Describe current flow.</li></ol>
3. To cover the principles of conductors and insulators.	<ol style="list-style-type: none"><li>1. Explain properties of conductors.</li><li>2. Explain properties of insulators.</li><li>3. Give examples of good conductors.</li></ol>
4. To understand electrical potential.	<ol style="list-style-type: none"><li>1. Explain what voltage is.</li><li>2. Describe units of measurement.</li><li>3. Describe AC and DC voltage.</li></ol>
5. To understand electrical current.	<ol style="list-style-type: none"><li>1. Define electrical current.</li><li>2. Explain how to produce electron flow.</li></ol>

Course Objective	Competencies
6. To understand electrical resistance.	3. Explain AC and DC current.  1. Define resistance. 2. Explain units of measurement. 3. Describe uses and benefits of electrical resistance.
7. To understand electrical power.	1. Define electrical power. 2. Explain units of measurement. 3. Explain power factor. 4. Calculate Btu/Watt. 5. Explain SEER rating.
8. To understand Ohm's Law.	1. Explain relationship of current, voltage, and resistance. 2. Give three forms of Ohm's law. 3. Calculate for resistance, current, and voltage.
9. To understand and apply electrical circuits.	1. Define series circuit. 2. Define parallel circuit. 3. Define open/closed switch position. 4. Calculate total resistance, current, voltage in a series circuit. 5. Calculate total resistance, current, voltage in a parallel circuit. 6. Describe application of series and parallel circuits.
10. To understand and use electrical meters.	1. Describe principles of analog and digital meters. 2. Describe inductive and in-line meters.

<b>Course Objective</b>	<b>Competencies</b>
11. To understand and use ammeters.	<ol style="list-style-type: none"><li>1. Describe connecting in-line meter.</li><li>2. Describe AC/DC operation.</li><li>3. Describe connecting inductive meter.</li><li>4. Describe how to measure very small amps with an inductive meter.</li><li>5. Describe ranges on a scale.</li></ol>
12. To understand and use voltmeters.	<ol style="list-style-type: none"><li>1. Describe connecting into AC/DC circuits.</li><li>2. Describe ranges on scale.</li><li>3. Describe range of acceptable voltage.</li></ol>
13. To utilize the ohmmeter/continuity tester.	<ol style="list-style-type: none"><li>1. Describe connecting meter into circuit.</li><li>2. Describe continuity.</li><li>3. Describe open circuit, closed circuit, short circuit.</li></ol>
14. To understand electrical components/symbols.	<ol style="list-style-type: none"><li>1. Define switch.</li><li>2. Define load.</li><li>3. Recognize symbols for common components.</li><li>4. Define direct/reverse acting switches.</li></ol>
15. To understand concepts of alternating current.	<ol style="list-style-type: none"><li>1. Define AC sine wave.</li><li>2. Define peak voltage.</li><li>3. Define effective voltage.</li><li>4. Define phase.</li><li>5. Define cycle/frequency.</li><li>6. Define inductance, reactance, impedance.</li></ol>

Course Objective	Competencies
16. To gain a knowledge of power distribution.	7. Define power factor for AC voltage.  1. Explain basis of power generating. 2. Identify reason for high voltage transmission. 3. Explain step-down transformer. 4. Explain single phase voltage. 5. Explain 3-phase voltage.
17. To explore the fundamentals of transformers.	1. Define step-up, step-down transformers. 2. Explain Delta transformer system. 3. Explain WYE transformer system. 4. List advantages of Delta, WYE systems.
18. To understand electric motors.	1. Explain basics of motor windings. 2. Explain purpose of capacitor. 3. Explain 3-phase motor wiring. 4. Explain thermal overload. 5. Explain start switch.
19. To understand relays, contactors, motor starters.	1. Explain operation of coil and contacts. 2. Explain operation of auxiliary switches. 3. Explain differences between relay, contactor, motor starter. 4. Describe thermal overload circuit.
20. To cover thermostats.	1. Describe operation of heat/cool thermostats. 2. Explain how to calibrate thermostat.

Course Objective	Competencies
<p>21. To explore limit switches in heat/cool systems.</p> <p>22. To understand stack-mounted primary controls.</p>	<ol style="list-style-type: none"> <li>3. Describe operation of heat anticipator.</li> <li>4. Explain how to adjust heat anticipator.</li> </ol> <ol style="list-style-type: none"> <li>1. Define high limit control.</li> <li>2. Define low limit control.</li> <li>3. Define reverse-acting control.</li> <li>4. Explain operation of differential switch.</li> </ol> <ol style="list-style-type: none"> <li>1. Explain operation of safety switch.</li> <li>2. Explain how to step contacts.</li> <li>3. Explain how to test safety timing.</li> <li>4. Explain interrupted/intermittent ignition.</li> </ol>