



## COURSE OUTLINE: ELR212 - PROCESS CONTROL

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Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	ELR212: PROCESS CONTROL
<b>Program Number: Name</b>	4104: INST CONTROL ENG TN
<b>Department:</b>	ELECT./INSTRUMENTATION PS
<b>Semesters/Terms:</b>	20W
<b>Course Description:</b>	This course is a study of process control systems including: single loop, multi-loop, cascade, ratio, feed forward and boiler control. The student will calibrate, adjust, tune, test and maintain these types of control systems.
<b>Total Credits:</b>	5
<b>Hours/Week:</b>	5
<b>Total Hours:</b>	75
<b>Prerequisites:</b>	ELN229
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Essential Employability Skills (EES) addressed in this course:</b>	<p>EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.</p> <p>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>EES 3 Execute mathematical operations accurately.</p> <p>EES 4 Apply a systematic approach to solve problems.</p> <p>EES 5 Use a variety of thinking skills to anticipate and solve problems.</p> <p>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 10 Manage the use of time and other resources to complete projects.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>
<b>Course Evaluation:</b>	Passing Grade: 50%, D
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>Student must pass both written tests and lab tests to pass the source.</p> <p>Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00</p>



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D 50 - 59% 1.00  
 F (Fail)49% and below 0.00

CR (Credit) Credit for diploma requirements has been awarded.  
 S Satisfactory achievement in field /clinical placement or non-graded subject area.  
 U Unsatisfactory achievement in field/clinical placement or non-graded subject area.  
 X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.  
 NR Grade not reported to Registrar's office.  
 W Student has withdrawn from the course without academic penalty.

**Books and Required Resources:**

Lab Volt Process Control Manual

**Course Outcomes and Learning Objectives:**

<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>
Understand process control terminology and define common Instrumentation terms	<ul style="list-style-type: none"> <li>- List the classifications of industrial control systems.</li> <li>- Identify open and closed loop systems.</li> <li>- Recognize and describe controller modes.</li> <li>- Recognize and describe single loop control dynamics.</li> <li>- Explain SAMA and ISA symbols.</li> <li>- Describe the use and list requirements for instrument air supply</li> <li>- Identify pneumatic control systems</li> <li>- Identify Hydraulic control systems</li> <li>- Understand the workings of SLC (Single Loop Controller)</li> </ul>
<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
Develop an insight into the concepts of tuning feedback controllers	<ul style="list-style-type: none"> <li>- Define the basis for tuning automatic controllers.</li> <li>- Review "damped" wave amplitude decay.</li> <li>- Describe the Trial and Error Method of controller tuning.</li> <li>- Calculate and apply the tuning parameters for a feedback controller using the Ziegler-Nichols ultimate method.</li> <li>- Understand adaptive controller tuning</li> </ul>
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
Understand the basic concepts of cascaded control	<ul style="list-style-type: none"> <li>- Understand the basic concept of feedback control</li> <li>- Understand the basic concept of feed-forward control</li> <li>- Explain the general guidelines for cascade controller mode selection.</li> <li>- Draw the block diagram of a cascade system</li> <li>- Identify primary and secondary systems.</li> <li>- Describe function of remote/local transfer.</li> <li>- Configure and tune a cascade system</li> </ul>
<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
Understand the basic concepts of ratio control.	<ul style="list-style-type: none"> <li>- Identify a ratio control system.</li> <li>- Draw the block diagram of a ratio control system.</li> <li>- Describe wild and controlled variables.</li> <li>- Calculate loop values for a common flow ratio system.</li> <li>- Configure and tune a ratio control system</li> </ul>
<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
Understand the basic concepts of feed-forward control	<ul style="list-style-type: none"> <li>- Analyse feed-forward control systems.</li> <li>- Draw the general block diagram of a feed-forward control system.</li> </ul>



		<ul style="list-style-type: none"> <li>- Identify limitations and problems of feed-forward control systems.</li> <li>- Describe the reasons for feedback trim on a feed-forward system.</li> <li>- Sketch a feed-forward control loop with feedback trim.</li> </ul>
	<b>Course Outcome 6</b>	<b>Learning Objectives for Course Outcome 6</b>
	Understand DCS control systems	<ul style="list-style-type: none"> <li>- Describe the functions of a DSC system</li> <li>- Analyze and troubleshoot DCS analog card</li> <li>- Configure DCS Analog input and output interfacing modules</li> <li>- Configure DCS, PID software advance instructions</li> <li>- Program a DCS to control a single loop process</li> </ul>

**Evaluation Process and Grading System:**

<b>Evaluation Type</b>	<b>Evaluation Weight</b>
Assignments	10%
Labs	20%
Practical Tests	20%
Written Tests	50%

**Date:**

December 17, 2019

**Addendum:**

Please refer to the course outline addendum on the Learning Management System for further information.

