



## COURSE OUTLINE: ELR722 - INSTRUMENTATION 2

Prepared: Randy Clouthier

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	ELR722: INSTRUMENTATION - LEVEL 2
<b>Program Number: Name</b>	6521: CONST & MTCE ELE INT 6540: IND.ELECT. - BASIC
<b>Department:</b>	ELEC. APPRENTICES
<b>Academic Year:</b>	2023-2024
<b>Course Description:</b>	This course will introduce the student to instrumentation theory relating to the measurement of pressure and flow in industrial processes. The theory is supported by appropriate labs.
<b>Total Credits:</b>	4
<b>Hours/Week:</b>	4
<b>Total Hours:</b>	40
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Vocational Learning Outcomes (VLO's) addressed in this course:</b>	<b>6521 - CONST &amp; MTCE ELE INT</b> VLO 1 Const and Maint Electrician - Int
<b>Please refer to program web page for a complete listing of program outcomes where applicable.</b>	<b>6540 - IND.ELECT. - BASIC</b> VLO 1 Industrial Electrician - Basic
<b>Essential Employability Skills (EES) addressed in this course:</b>	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. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals. EES 10 Manage the use of time and other resources to complete projects. EES 11 Take responsibility for ones own actions, decisions, and consequences.



<b>Course Evaluation:</b>	<p>Passing Grade: 50%, D</p> <p>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.</p>								
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>The student must pass both the written tests and the practical tests to pass the course.</p> <p>Smart watches, smart phones and similar devices are not allowed during tests or quizzes and must be removed. Smart phones are not acceptable for use as a calculator during a test or quiz.</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 D 50 - 59% 1.00 F (Fail)49% and below 0.00</p> <p>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.</p>								
<b>Books and Required Resources:</b>	<p>Lab Volt Process Control Training Manual by Sault College Publisher: AK Graphics LABVOLT ELN229 (Sault Coll)</p>								
<b>Course Outcomes and Learning Objectives:</b>	<table border="1"> <thead> <tr> <th data-bbox="506 940 802 973"><b>Course Outcome 1</b></th> <th data-bbox="808 940 1430 973"><b>Learning Objectives for Course Outcome 1</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="506 980 802 1289">1. Describe the terminology and concepts commonly used in instrumentation systems.</td> <td data-bbox="808 980 1430 1289">           1.1 Explain the concept of weight, mass, density, and specific gravity of a fluid.            1.2 Describe the behavior of gasses and calculate their properties under varying conditions.            1.3 Describe the concept of direct and indirect measurement.            1.4 Examine how indirect measurement is accomplished.            1.5 Describe the operation and application of load cells and strain gauges.            1.6 Explain the operation of voltage and current instrumentation loops and the purpose of shielding.            1.7 Install, connect, zero, and span an instrumentation control loop.         </td> </tr> <tr> <th data-bbox="506 1296 802 1329"><b>Course Outcome 2</b></th> <th data-bbox="808 1296 1430 1329"><b>Learning Objectives for Course Outcome 2</b></th> </tr> <tr> <td data-bbox="506 1336 802 1433">2. Understand and draw basic process diagrams according to ISA standards.</td> <td data-bbox="808 1336 1430 1433">           2.1 Examine ISA symbols used in level and flow measurement and control systems.            2.2 Draw basic balloon and P&amp;I diagrams to ISA standards.         </td> </tr> </tbody> </table>	<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>	1. Describe the terminology and concepts commonly used in instrumentation systems.	1.1 Explain the concept of weight, mass, density, and specific gravity of a fluid. 1.2 Describe the behavior of gasses and calculate their properties under varying conditions. 1.3 Describe the concept of direct and indirect measurement. 1.4 Examine how indirect measurement is accomplished. 1.5 Describe the operation and application of load cells and strain gauges. 1.6 Explain the operation of voltage and current instrumentation loops and the purpose of shielding. 1.7 Install, connect, zero, and span an instrumentation control loop.	<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>	2. Understand and draw basic process diagrams according to ISA standards.	2.1 Examine ISA symbols used in level and flow measurement and control systems. 2.2 Draw basic balloon and P&I diagrams to ISA standards.
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	<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
	3. Describe and demonstrate the concepts associated with fluid level and level measurement.	3.1 Describe the concept of hydrostatic pressure. 3.2 Calculate the hydrostatic pressure exerted by a column of fluid. 3.3 Demonstrate the ability to measure the hydrostatic pressure exerted by a column of liquid and calculate the liquid level. 3.4 Describe the operation of common level measurement devices such as float switches, point contact, sight glass, capacitance devices, ultrasonic, radiation and bubbler systems.
	<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
	4. Describe and demonstrate the concepts associated with fluid flow and flow measurement.	4.1 Describe the concept of fluid flow. 4.2 Describe the operation of differential pressure flow primary elements such as a Venturi and Orifice Plate and calculate the fluid flow. 4.3 Demonstrate the ability to measure fluid flow using a primary element with a differential pressure transmitter and calculate the fluid flow. 4.4 Identify and describe the operation of other various flow sensing elements such as rotameters, magnetic flow meters, turbine meters, positive displacement meters, weirs, and flumes.

**Evaluation Process and Grading System:**

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

**Date:** May 30, 2023

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