Instrumentation Engineering Technology - Diploma

PLAR Candidate Guide

Prior Learning Assessment and Recognition (PLAR)

Prior learning credit options at Saskatchewan Polytechnic

See Get Credit for What you Know for important information about all options to get credit for prior learning at Sask Polytech, including PLAR, transfer credit, Canadian Armed Forces credit, and equivalency credit.

How to navigate this document

This document contains links to other document sections or webpages. To return to where you were from another section in this document, press the *ALT* key and *left arrow* key at the same time. To return to this webpage from another webpage, close the other webpage or click back on the browser tab for this document.

Contents of this guide

This guide contains the following specific PLAR information and tools for this program

A. PLAR fees

Fees for PLAR challenges are set to cover our costs for consultation, assessment, and related administrative tasks. PLAR fees are non-refundable and non-transferrable.

The PLAR fees policy is subject to change for each new academic year. Please see the **Cost** section on the PLAR webpage for current fee information.

B. PLAR eligibility and options

To be eligible for PLAR for courses in this program, you must first apply for admission and be accepted into the program. You must also consult with the PLAR contact person and be approved for PLAR assessment.

Some courses have one or more other courses that must be completed first (pre-requisite) or at the same time (co-requisite). See course outlines in this guide to identify any pre- or co-requisites for each course. Discuss with your PLAR contact person how to deal with courses with co-requisites.

Block assessment

Some programs may assess a cluster of courses together in one block, which may save you time and effort. Ask the PLAR contact person whether there are any block assessment options in this program.

C. Dates when PLAR assessment is available

PLAR assessment for this program is available from Sept 1 to June 15 in each academic year.

All PLAR assessments must be completed by June 15 of each academic year.

D. Special directions for this program

1. **Review** the PLAR process and FAQs and the information in this guide.
2. **Self-rate** your learning for each course using the Course Outlines in this guide.
3. **Consult** with the PLAR contact person for PLAR approval. Be prepared to provide your resume, course self-ratings (see section F), and a partially completed PLAR application. If you are approved for PLAR, the contact person will sign your PLAR application and explain next steps.
4. Apply for admission to the program. See directions for applying.
5. **Register** for PLAR at Registration/Enrollment Services once you have signed approval on your PLAR Application Form. The PLAR fee will be added to your student account.
6. **Finalize** an assessment plan with your assigned assessor**.**
7. **Complete** assessment before your PLAR registration expires.

E. PLAR contact person

Contact one of the Program Heads below to arrange a consultation **after** you have read this guide and general PLAR information **and** rated yourself for each course (see next section). Consultation may be by phone, online, or in person. Be prepared to provide your resume, course self-ratings, and a partially completed PLAR application. If agreement is reached to go ahead with PLAR, the contact person will sign approval on your PLAR application and explain the next steps. Admission to the program is required before you can register for PLAR.

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F. Self-rating course outlines

Clicking on a course code below opens a page where you can rate yourself on the knowledge and skills assessed for PLAR credit. For Arts & Sciences courses, clicking on the course code opens another PLAR guide. The PLAR contact person for this program will refer you to another person to discuss PLAR for courses delivered by Arts & Sciences or another program/department.

COURSE CODE	COURSE NAME	Delivered by another department/program
Semester 1		
CIRC 105	Basic Electronics	
CIRC 106	Basic Electronics Lab	
INST 105	Industrial Instrumentation Practices	
MAT 110	Mathematics for Engineering Technologies	
MEAS 111	Instrument Measurement 1	
MEAS 112	Instrument Measurement 1 Lab	
PHYS 107	Instrumentation Physics	
SEM 101	Technology Seminars	
Semester 2		
CHEM 125	Chemistry 1	
CIRC 107	Digital Electronics	

COURSE CODE	COURSE NAME	Delivered by another department/program
CIRC 108	Digital Electronics Lab	
INST 106	Instrumentation Safety	
INST 107	Industrial Instrumentation Documentation	
INST 221	Final Control Elements	
MAT 112	Differential Calculus for Engineering Technologies	
TCOM 102	Workplace Communication	Arts & Sciences
Semester 3		
CHEM 225	Chemistry 2	
CIRC 200	Automation Circuits 1	
CNTR 207	Instrument Control 1	
CNTR 208	Instrument Control 1 Lab	
COMP 218	Industrial Computer Applications	
MAT 210	Integral Calculus for Engineering Technologies	
MEAS 200	Instrument Measurement 2	
TCOM 103	Technical Communication	Arts & Sciences
Semester 4		
CIRC 222	Automation Circuits 2	
CNTR 209	Instrument Control 2	
CNTR 210	Distributed Control Systems	
MAT 211	Advanced Mathematics for Engineering Technologies	
MEAS 201	Instrument Measurement: Analyzers 1	
PROJ 227	Project Management	
Semester 5		
CIRC 201	Automation Circuits 3	

COURSE CODE	COURSE NAME	Delivered by another department/program
CIRC 202	Industrial Data Communications and Networks	
CIRC 203	Industrial Data Communications and Networks Lab	
CLTR 100	Diversity	Arts & Sciences
CNTR 229	Advanced Controls	
MEAS 202	Instrument Measurement Technology	
PROJ 206	Capstone Project	
STAT 201	Statistics for Engineering Technology	
TCOM 104	Applied Research in Technology	Arts & Sciences

CIRC 105 - Basic Electronics

Your studies will focus on the principles of electronic circuits. You will study direct current (DC) and alternating current (AC) circuits, and solid-state devices. Circuit analysis techniques will be emphasized throughout the course.

Credit unit(s): 4.0
Pre-Requisites: none
Co Requisites: CIRC 106
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze the basics of electricity voltage, current and resistance.			
2. Apply Ohm's and Kirchhoff's laws for simple direct current (DC) circuit analyses.			
3. Analyze series, parallel, and combination circuits.			
4. Apply Ohm's and Kirchhoff's Laws for simple alternating current (AC) circuit analyses.			
5. Analyze inductance and capacitance in simple resistance-capacitance (RC) and resistor-inductor (RL) circuits.			
6. Determine resistance, reactance, and impedance in AC and resonant circuits.			
7. Explain the transformer's working principle in the context of magnetic circuits			

CIRC 106 - Basic Electronics Lab

The practical instruction in the laboratory supports the fundamentals of electronic circuits. The course covers basic skills in building, measuring, and analyzing electronic circuits with contemporary laboratory equipment.

Credit unit(s): 3.0
Pre-Requisites: none
Co Requisites: CIRC 105
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Measure current, voltage, and resistance in a direct current (DC) electrical circuit.			
2. Demonstrate DC circuit operation using Ohm's and Kirchhoff's laws.			
3. Measure the equivalent resistance of series, parallel and series-parallel circuits.			
4. Apply the superposition theorem to DC circuits.			
5. Demonstrate alternating current (AC) circuit operation using Ohm's and Kirchhoff's laws.			
6. Measure time constant of resistance-capacitance (RC) and resistor-inductor (RL) circuits.			
7. Measure voltages and phase angles in AC circuits.			
8. Measure current, voltage and resistance using a step-down transformer.			

INST 105 - Industrial Instrumentation Practices

You will discuss and apply appropriate safety practices in an industrial setting. You will operate basic hand and power tools. You will demonstrate proper tube bending techniques. You will use layout drawings, basic wiring and troubleshooting practices, to aid in the construction of an instrument panel.

Credit unit(s): 3.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Practice working safely in an industrial environment.			
2. Examine tools and equipment, their applications, maintenance, and procedures for use.			
3. Discuss instrumentation tools for practical applications.			
4. Interpret standard industrial panel drawings.			
5. Assemble instrument tube installations.			
6. Assemble instrumentation wiring installations.			
7. Operate tools and equipment necessary for practical instrumentation applications.			

MAT 110 - Mathematics for Engineering Technologies

You will gain foundational knowledge of mathematical topics applicable to engineering technologies. You will study formula manipulations, factoring of algebraic expressions, geometry and trigonometry, exponents and logarithms, and functions and their graphs. This course is intended to build problem solving and critical thinking skills, and to prepare you for studies in calculus.

Credit unit(s): 4.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine measurements, formulas, and functions.			
2. Practice mathematical operations with algebraic expressions.			
3. Apply principles of geometry.			
4. Analyze trigonometric functions and vectors.			
5. Examine systems of linear equations.			
6. Examine algebraic equations and functions.			
7. Analyze exponential and logarithmic functions.			

MEAS 111 - Instrument Measurement 1

You will study the principles and measurement of pressure, level, temperature, and flow. The theory presented will be reinforced by practical applications in Instrument Measurement Lab.

Credit unit(s): 4.0
Pre-Requisites: none
Co Requisites: MEAS 112
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe transmitter signals and terminology.			
2. Interpret pressure measurement.			
3. Examine pressure measurement instruments.			
4. Interpret level measurement.			
5. Examine level measurement instruments.			
6. Interpret temperature measurement.			
7. Examine temperature measurement instruments.			
8. Interpret flow measurement.			
9. Examine flow measurement instruments.			

MEAS 112 - Instrument Measurement 1 Lab

You will safely specify, calibrate, operate, and measure using both pneumatic and conventional instruments. You will practice troubleshooting skills while calibrating pneumatic and conventional instruments.

Credit unit(s): 3.0
Pre-Requisites: none
Co Requisites: MEAS 111
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Calibrate pressure measuring instruments.			
2. Measure pressure using instruments.			
3. Calibrate level measuring instruments.			
4. Measure level using instruments.			
5. Calibrate temperature measuring instruments.			
6. Measure temperature using instruments.			
7. Calibrate flow measuring instruments.			
8. Measure flow using instruments.			
9. Troubleshoot measurement instruments.			

PHYS 107 - Instrumentation Physics

You will study rotational motion, fluid mechanics, temperature, heat, and thermal properties of matter.

Credit unit(s): 3.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine rotational motion.			
2. Use knowledge of fluids at rest to analyze various situations.			
3. Solve problems involving fluids in motion.			
4. Solve problems involving heat and temperature.			
5. Examine ideal gas properties in static and dynamic conditions.			
6. Apply the principles of thermodynamics.			

SEM 101 - Technology Seminars

Your orientation will include discussions regarding the role of technicians/technologists in the workplace and society. You will study time management skills, diversity in the workplace, principles of sustainability and safety requirements.

Credit unit(s): 1.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Develop study and time management skills.			
2. Recognize diversity in the workplace.			
3. Recognize principles of sustainability to work.			
4. Discuss professional ethics, responsibility, and accountability.			
5. Discuss the impact of technology on society.			
6. Describe workplace safety procedures.			

CHEM 125 - Chemistry 1

You will gain knowledge in the identification, analysis and solving problems in the analysis of chemical compounds and reactions used in instrumentation. This course stresses the design of and applied chemical analysis used in instrumentation analyzers.

Credit unit(s): 4.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Identify steps in the chemical laboratory safety plan.			
2. Illustrate error calculations used in laboratory calculations.			
3. Explain the procedure used in naming inorganic and organic chemical compounds.			
4. Investigate stoichiometric analysis involved in chemical reactions.			
5. Identify types of chemical reactions.			
6. Determine the differences between the ideal and non-ideal gas behavior.			
7. Calculate physical differences defining solution chemistry.			
8. Examine the concepts of equilibrium chemistry.			
9. Examine the concepts of acid-base chemistry.			
10. Examine the concepts of oxidation-reduction chemistry.			

CIRC 107 - Digital Electronics

You will study the principles of digital logic and digital logic components. You will design and analyze basic logic circuits.

Credit unit(s): 4.0
Pre-Requisites: CIRC 105, CIRC 106
Co Requisites: CIRC 108
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe solid state devices.			
2. Analyze the characteristics of gates and truth tables.			
3. Design Boolean equations for logic diagrams.			
4. Examine flip-flops.			
5. Design counters and registers using gates and flip-flops.			
6. Apply digital logic to process control instrumentation.			
7. Examine signal converters for given applications.			
8. Investigate number systems.			

CIRC 108 - Digital Electronics Lab

You will demonstrate principles of digital logic circuits and logic functions.

Credit unit(s): 3.0
Pre-Requisites: CIRC 105, CIRC 106
Co Requisites: CIRC 107
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze solid state devices.			
2. Demonstrate characteristics of logic gates.			
3. Construct Boolean equations for logic diagrams with a logic trainer.			
4. Demonstrate the characteristics of integrated circuits.			
5. Construct digital logic applications in process control instrumentation with logic trainers.			
6. Demonstrate the use of signal converters.			

INST 106 - Instrumentation Safety

You will describe a variety of area classification methods for preventing explosions. You will demonstrate principles of design, selection, installation, testing, and maintenance of intrinsically safe systems.

Credit unit(s): 1.0
Pre-Requisites: MEAS 111, MEAS 112
Co Requisites: INST 107
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Classify hazardous locations.			
2. Identify principles of intrinsic safety.			
3. Design an intrinsically safe system.			

INST 107 - Industrial Instrumentation Documentation

You will identify and sketch industrial process symbols as per International Society of Automation (ISA) standards. You will interpret and develop various process-related diagrams including loop drawings and piping and instrument drawings (P&ID) using a combination of hand-drawn and computer-aided drawing software techniques. You will interpret multiple industrial drawing types, including process flow diagrams and Scientific Apparatus Makers Association (SAMA) diagrams.

Credit unit(s): 3.0
Pre-Requisites: MEAS 111, MEAS 112
Co Requisites: INST 106
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Interpret standard industrial drawings.			
2. Develop standard industrial piping and instrument drawings per International Society of Automation ISA standards.			
3. Develop electrical process loop wiring diagrams per ISA standards.			
4. Develop control narratives.			
5. Interpret functional control Scientific Apparatus Makers Association (SAMA) diagrams.			
6. Develop functional control SAMA diagrams.			

INST 221 - Final Control Elements

You will study control valves and pressure relief devices. Examining, selecting, sizing, and calibrating final control elements will be emphasized. You will verify theoretical concepts and practice maintaining, calibrating, and installing control valves.

Credit unit(s): 4.0
Pre-Requisites: INST 105, MEAS 111, MEAS 112
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Compare control valves for various applications.			
2. Examine flow characteristics.			
3. Select control valve accessories.			
4. Determine appropriate methods to eliminate or minimize cavitation.			
5. Size control valves for specified applications.			
6. Select equipment to control process noise.			
7. Select control valve materials of construction.			
8. Compare safety relief devices for various applications.			
9. Service control valves.			
10. Calibrate current to pressure transducers (I/P's).			

MAT 112 - Differential Calculus for Engineering Technologies

You will gain knowledge of differential calculus topics applicable to engineering technologies. You will study continuity, limits, algebraic and transcendental derivatives, and their applications. This course is intended to build further problem solving and critical thinking skills, and to demonstrate the importance of calculus in engineering practices.

Credit unit(s): 3.0
Pre-Requisites: MAT 110
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze limits and continuity of functions.			
2. Examine the derivative through the study of slopes and limits.			
3. Calculate derivatives of algebraic functions.			
4. Use first and second derivatives to graph functions.			
5. Calculate derivatives of transcendental functions.			
6. Analyze technical problems involving rates of change and optimization.			

TCOM 102 - Workplace Communication

You will examine the employability skills required in the workplace. You will discuss the communication process, and practice effective interpersonal communication techniques and conflict resolution. You will use workplace writing and job search skills.

Credit unit(s): 3.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine fundamentals of workplace communication.			
2. Discuss conflict resolution techniques.			
3. Apply job-related interpersonal and oral communication strategies.			
4. Apply workplace writing skills.			
5. Use job search skills.			

CHEM 225 - Chemistry 2

You will gain knowledge of analytical chemistry and instrumentation to study the theory and practices of chemical sampling and analysis. This course presents fundamentals and techniques of chemical laboratory measurement.

Credit unit(s): 3.0
Pre-Requisites: CHEM 125
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine the components of acid and base chemistry used in calibrating and using a pH analyzer.			
2. Examine the components of solution chemistry used the calibration and use of a conductivity analyzer.			
3. Identify the concepts use of the Beer Lambert Law for the spectrophotometric (ultraviolet) analysis of turbidity measurements.			
4. Explore the use of the Henderson-Hasselback equation in determining a solution pH and its application of buffer components in maintaining a constant pH value.			
5. Examine applications of oxidation-reduction chemistry used in the calibration of an oxidation-reduction potential analyzer.			
6. Illustrate the application of mass, volume of flow, density (specific gravity) and concentration measurements of liquids and gases used in the Coriolis Mass Flowmeters (densitometer).			
7. Layout the calibration and molecular chemical analysis of liquid and gaseous substances using a gas chromatograph.			
8. Identify the stoichiometric chemical reactions altering the atmospheric concentration of oxygen values using an oxygen analyzer.			
9. Illustrate the effects of water on chemical reactions using humidity analyzers.			

CIRC 200 - Automation Circuits 1

You will study the operation and applications of electro-mechanical relays. Your studies will focus on the concepts of normally open, normally closed, instantaneous and time-delay relay contacts and coils. As an introduction to programmable logic controllers (PLCs), you will design logic control circuits using electro-mechanical relays and compact PLCs.

Credit unit(s): 4.0
Pre-Requisites: CIRC 107, CIRC 108
Co Requisites: COMP 218
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Connect a basic start-stop circuit using a standard relay.			
2. Connect sequential applications with relays.			
3. Design automatic circuits employing interlocks and permissive conditions with relays.			
4. Demonstrate knowledge of variable speed drive and their components, characteristics, operating principles, parameters, and applications.			
5. Demonstrate knowledge of programmable logic controllers (PLC), their components, operation, architecture, and capabilities.			
6. Design automatic circuits employing interlocks and permissive conditions with a compact PLC.			
7. Demonstrate knowledge of human machine interface and their components, purpose, operation, design, and capabilities.			
8. Test PLC applications.			
9. Produce a project design document.			

CNTR 207 - Instrument Control 1

You will study the principles and applications of process control algorithms, cascade control, ratio control and feed-forward control. The course content includes the analysis of open loop responses to PID controllers, the analysis of non-linear control elements and the selection and application of controller tuning techniques.

Credit unit(s): 3.0
Pre-Requisites: CIRC 107, CIRC 108, INST 105, INST 221
Co Requisites: CNTR 208
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe the fundamental elements of a controller.			
2. Analyze the mathematical basis for tuning modes.			
3. Examine tuning techniques for PID controllers on a given process.			
4. Analyze pneumatic and electronic controller circuitry.			
5. Examine control strategy problems such as offset, cycling.			
6. Select methods of controller tuning.			
7. Analyze process response for tuning purposes.			
8. Select control strategies for optimum performance.			
9. Apply a feedforward control strategy for optimum performance.			
10. Apply selective control strategies to various processes.			
11. Develop solutions to reduce control loop interaction.			

CNTR 208 - Instrument Control 1 Lab

You will study the principles and applications of process control algorithms, cascade control, ratio control and feed-forward control. The course content includes the analysis of open loop responses to PID controllers, the analysis of non-linear control elements and the selection and application of controller tuning techniques.

Credit unit(s): 2.0
Pre-Requisites: CIRC 107, CIRC 108, INST 105, INST 106, INST 107, INST 221
Co Requisites: CNTR 207, MEAS 200
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe the fundamental elements of a controller.			
2. Analyze the mathematical basis for tuning modes.			
3. Tune a PID controller for a given process.			
4. Analyze pneumatic and electronic controller circuitry.			
5. Troubleshoot control strategy problems such as offset, cycling.			
6. Analyze process response for tuning purposes.			

COMP 218 - Industrial Computer Applications

You will use an object-oriented programming language to create and document solutions to instrumentation-related scenarios. You will examine logical flowcharts and pseudocode to aid in your development of algorithms appropriate for process automation applications. You will manage programming elements such as datatypes, objects, and logical structures, while placing emphasis on program documentation.

Credit unit(s): 3.0
Pre-Requisites: CIRC 107, CIRC 108
Co Requisites: CIRC 200
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine computer programming components and logic.			
2. Construct flowcharts related to industrial process control.			
3. Examine pseudocode related to instrumentation control strategies.			
4. Apply sequential programming logic structure.			
5. Create decision and repetition programming logic structure.			
6. Create decision and repetition logic to problems involving an array of data input.			
7. Design functions and procedures for event driven and flow driven programming.			
8. Construct event driven or flow driven programming solutions for instrumentation control narratives.			

MAT 210 - Integral Calculus for Engineering Technologies

You will gain knowledge of integral calculus topics applicable to engineering technologies. You will study algebraic and transcendental integrals, differential equations, and their applications. This course is intended to build further problem solving and critical thinking skills, and to demonstrate the importance of calculus in engineering practices.

Credit unit(s): 3.0
Pre-Requisites: MAT 112
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine the indefinite and definite integral.			
2. Calculate integrals of functions.			
3. Analyze technical problems with integration.			
4. Calculate integrals with the use of advanced techniques.			
5. Analyze first-order differential equations.			

MEAS 200 - Instrument Measurement 2

You will examine the operational theories of various microprocessor-based instruments and their applications in industry. Your studies will include practical lab exercises where you will configure and calibrate highway addressable remote transducer (HART) microprocessor-based instruments used for the measurement of flow, level, temperature, and pressure.

Credit unit(s): 4.0
Pre-Requisites: CIRC 107, CIRC 108, INST 107, INST 221
Co Requisites: CNTR 207
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Calibrate process alarms.			
2. Interpret the principle of operation of microprocessor-based instruments.			
3. Describe the operational theory of highway addressable remote transducer (HART).			
4. Use industrial database software for asset management purposes.			
5. Use a field communicator.			
6. Analyze digital valve positioners.			
7. Calibrate microprocessor-based flowmeters.			
8. Calibrate microprocessor-based temperature transmitter.			
9. Calibrate microprocessor-based pressure transmitters.			
10. Calibrate microprocessor-based level transmitters.			

TCOM 103 - Technical Communication

You will use research skills to find technical information and cite it correctly. You will conduct effective meetings and produce supporting documents. As well, you will discuss technical report purposes and formats, write short technical reports and present technical information.

Credit unit(s): 3.0
Pre-Requisites: TCOM 102, COM 170
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Conduct research for a technical report.			
2. Use correct grammar and technical style.			
3. Create technical reports.			
4. Conduct meetings.			
5. Present technical information.			

CIRC 222 - Automation Circuits 2

You will study the analysis, design and troubleshooting of automation equipment. You will gain insight into microprocessor, microcontroller, and programmable logic controller (PLC) applications in industrial measurement and control.

Credit unit(s): 4.0
Pre-Requisites: CIRC 200, COMP 218
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine basic computer hardware.			
2. Examine basic computer online system requirements.			
3. Examine the industrial automation architecture.			
4. Describe digital and analog conversion circuits.			
5. Evaluate point-to-point communications.			
6. Evaluate industrial communications media.			
7. Discuss the basics of Supervisory Control and Data Acquisition (SCADA) systems.			

CNTR 209 - Instrument Control 2

Configuration software and process simulation will be used to help you learn how to design, analyze,and evaluate various control strategies. The course content includes various process control applications (such as boiler, distillation column, compressor, and heat exchanger controls).

Credit unit(s): 4.0
Pre-Requisites: CIRC 200, CNTR 207, CNTR 208, MEAS 200
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze commonly used industrial control systems for heat exchange applications.			
2. Analyze commonly used industrial control systems for distillation applications.			
3. Analyze compressor surge control systems.			
4. Configure microprocessor-based controllers for given control applications.			
5. Describe industrial boiler operations.			
6. Assess the operation of several different processes including industrial boiler operations.			

CNTR 210 - Distributed Control Systems

You will configure a distributed control system including a Human Machine Interface (HMI). To operate a process incorporating microprocessor-based field devices. The course content includes analog control, discrete control, cascade control, feedforward control, and sequential function charts.

Credit unit(s): 4.0
Pre-Requisites: CIRC 200, CNTR 207, CNTR 208, MEAS one
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe Distributed Control Systems (DCS) architecture.			
2. Configure input/output (I/O) channels.			
3. Configure analog monitoring modules.			
4. Configure discrete modules.			
5. Configure control modules.			
6. Create a High-Performance Human Machine Interface (HMI).			
7. Tune process control loops.			
8. Create sequential function charts (SFC's).			
9. Commission a process area to facilitate start-up.			
10. Create operator manual.			

MAT 211 - Advanced Mathematics for Engineering Technologies

You will gain knowledge of advanced mathematical topics applicable to engineering technologies. You will study series expansions, differential equations, and Laplace and Fourier transforms. This course is intended to further build problem solving and critical thinking skills, and to demonstrate the modelling of physical systems with differential equations.

Credit unit(s): 3.0
Pre-Requisites: MAT 210
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine the series expansions of functions.			
2. Analyze second-order differential equations.			
3. Examine the Fourier and Laplace transform.			
4. Solve differential equations with Laplace transforms.			
5. Analyze physical systems with Laplace transforms.			

MEAS 201 - Instrument Measurement: Analyzers 1

You will study the implementation and purpose of analytical measurement systems. Given specifications, you will operate and calibrate pH, oxidation-reduction potential, conductivity, humidity, mass spectrometers and density analyzers.

Credit unit(s): 3.0
Pre-Requisites: CHEM 225, CNTR 207, CNTR 208, MEAS 200
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Perform calibration on a pH analyzer.			
2. Perform calibration on a conductivity analyzer.			
3. Perform calibration on an oxidation-reduction potential analyzer.			
4. Measure relative humidity using a sling psychrometer and capacitive polymer sensor.			
5. Perform calibration on a Coriolis densitometer.			
6. Perform calibration on an ultraviolet light infrared (UV/IR) detector.			

PROJ 227 - Project Management

You will be introduced to project management. You will examine the basic theory of project planning and control, from project initiation to project close out. You will apply research techniques and various tools to practice project management theory.

Credit unit(s): 2.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Discuss project management concepts.			
2. Explain the process to initiate a project.			
3. Create a project plan.			
4. Explain the methods used to execute a project plan.			
5. Explain monitoring requirements of a project.			
6. Discuss closing requirements of a project.			

CIRC 201 - Automation Circuits 3

You will study the design and implementation of logic control systems using microprocessor-based modular programmable logic controllers (PLCs). The course content includes using graphical programming languages. You will configure, select, and study the installation of PLCs. Practical lab applications will include programming timers, counters, math instructions and sequential operations.

Credit unit(s): 4.0
Pre-Requisites: CIRC 222
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Explain the different aspects of the programmable logic controls (PLCs) input-output system and central processing unit.			
2. Configure a modular programmable logic controller.			
3. Evaluate the various mathematical functions & branching instructions using the modular PLC.			
4. Examine the various aspects of process control using modular PLC's.			
5. Apply control design principles using a modular PLC.			
6. Troubleshoot the PLC system.			
7. Service the PLC system.			

CIRC 202 - Industrial Data Communications and Networks

You will study digital communication concepts, industrial networks, local area networks, and wide area networks including fiber optics.

Credit unit(s): 3.0
Pre-Requisites: CIRC 222
Co Requisites: CIRC 203
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Discuss local area network (LAN) topologies.			
2. Describe knowledge of function of local area network LAN devices, their applications, use and access methods.			
3. Explain various industrial communication protocols.			
4. Discuss fiber optic systems.			
5. Explain the fundamentals of Remote Terminal Units (RTUs) and Programmable Automation Controllers (PACs).			
6. Discuss Supervisory Control and Data Acquisition (SCADA) communication systems.			

CIRC 203 - Industrial Data Communications and Networks Lab

You will design, analyze, install, and evaluate digital data communication systems in industrial automation.

Credit unit(s): 2.0
Pre-Requisites: CIRC 222
Co Requisites: CIRC 202
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Evaluate communications media.			
2. Evaluate various industrial communication protocols.			
3. Demonstrate knowledge of procedures used to install, configure, and maintain Supervisory Control and Data Acquisition (SCADA) systems and components.			
4. Demonstrate knowledge of procedures used to diagnose, repair, and replace SCADA systems and components.			
5. Configure human machine interface (HMI) systems.			
6. Program data historian packages.			
7. Troubleshoot a SCADA communication system.			

CLTR 100 - Diversity

You will examine the elements of cultural, gender and disability diversity in Canada and the processes that promote inclusion. You will explore elements of Indigenous culture with a view to understanding both historical elements and contemporary issues in Canada. Your studies will also provide opportunities to participate in various cultural practices.

Credit unit(s): 0.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine the diverse Canadian identity.			
2. Describe diversity and social inequality in Canadian society.			
3. Examine the impact of colonization and treaties on Indigenous peoples.			
4. Examine contemporary realities and resilience of Indigenous people in Canada.			
5. Explore cultural events.			
6. Promote inclusion.			

CNTR 229 - Advanced Controls

Your studies will focus on feedback control systems, the basic tools, and yardsticks that a technologist uses to design and analyze control systems. You will learn how to mathematically model a process, select best applications of field devices and control hardware to fit the applications.

Credit unit(s): 3.0
Pre-Requisites: CNTR 209, CNTR 210
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze control systems to determine the transfer functions.			
2. Analyze the characteristics of control system components.			
3. Discuss a mathematical model for a control system.			
4. Determine the behavior of systems under changing conditions using Laplace Transforms.			
5. Determine the time response of first and second-order control systems.			
6. Apply various types of transmitters to fit various processes.			
7. Analyze industrial controllers and their application.			

MEAS 202 - Instrument Measurement: Analyzers 2

You will identify sampling system components. You will perform calibration of a gas chromatograph oxygen analyzer, combustibles, and toxic gas detectors and a turbidimeter. Theory and practical aspects of vibration will be examined.

Credit unit(s): 3.0
Pre-Requisites: MEAS 201
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Identify sampling system components.			
2. Perform calibration of a gas chromatograph.			
3. Perform calibration of an oxygen analyzer.			
4. Perform calibration of toxic and combustible gas detectors.			
5. Perform calibration of a turbidimeter.			
6. Examine theory and practical aspects of vibration using iLearn Vibration program.			

PROJ 206 - Capstone Project

You will apply the engineering concepts and principles to develop a significant initiative or project. Working individually or in small groups, you will use interpersonal, problem solving, and project management skills to propose, conceptualize, design, and demonstrate an engineering project that is both significant and relevant to your field of practice. You will manage and schedule the project with minimal direction. You will develop a presentation appropriate for an industry client and demonstrate the communication skills necessary to defend the technical specifications and the relevance of project in relation to the initial engineering problem.

Credit unit(s): 2.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Propose a project and research the technical and design aspects required to complete the project.			
2. Manage scheduling to ensure timely completion of the project.			
3. Collect data required per the project proposal.			
4. Analyze the project and provide solutions to project design.			
5. Prepare a final report.			
6. Defend project conclusions in a technical presentation.			

STAT 201 - Statistics for Engineering Technology

You will gain knowledge of statistical concepts and techniques applicable to engineering technology. You will study descriptive statistics, probability distributions, the Central Limit Theorem, inferential statistics, and linear regression. This course is intended to build problem solving and critical thinking skills, and to demonstrate the importance of statistics in professional practices.

Credit unit(s): 3.0
Pre-Requisites: none
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Define statistical terminology and procedures.			
2. Apply measures of central tendency to technical problems.			
3. Apply measures of dispersion and the Central Limit Theorem to descriptive statistics.			
4. Examine basic probability.			
5. Examine probability distributions of random variables.			
6. Apply the Normal Probability Distribution and the Central Limit Theorem to inferential statistics.			
7. Apply confidence intervals and tests of hypothesis to technical problems.			
8. Analyze paired statistical data using simple linear regression.			

TCOM 104 - Applied Research in Technology

You will develop a technical proposal and apply advanced research skills to a technical problem. You will use the technical problem-solving process in an applied research project and present your research findings in a written report and oral presentation.

Credit unit(s): 2.0
Pre-Requisites: TCOM 103, ENGL 101
Co Requisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Develop a technical proposal.			
2. Apply advanced research skills			
3. Describe the technical problem-solving process.			
4. Employ the problem-solving process in an applied research project.			
5. Present research findings.			