



Innovative Manufacturing - Diploma

PLAR Candidate Guide

Prior Learning Assessment and Recognition (PLAR)

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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

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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 you must consult with the PLAR contact person and be approved for PLAR assessment.

Course pre-requisites and co-requisites

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. **Register** for PLAR at [Registration/Enrolment Services](#) once you have signed approval on your [PLAR Application Form](#). The PLAR fee will be added to your student account.
5. **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.

Phil Ursulescu, Program Head
 Saskatchewan Polytechnic, Campus
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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		
CAD 106	Autodesk Inventor (3D)	
CLTR 200	Culture and Diversity	Arts & Sciences
DRFT 174	Drafting Principles	
ENGL 101	Critical Reading and Writing	Arts & Sciences
MACH 108	Machine Shop fundamentals	
MATH 104	Applied Mathematics	Arts & Sciences
MEAS 161	Precision Measurement and Tooling	
SEM 101	Technology Seminars	Arts & Sciences
Semester 2		
COAP 172	Computer Applications	
COM 170	Professional Workplace Communications	Arts & Sciences
DRFT 177	Mechanical Drafting	
MACH 155	Drilling Machine Operations	

COURSE CODE	COURSE NAME	Delivered by another department/program
MATH 167	Applied Mathematics 2	Arts & Sciences
MECH 160	Applied Mechanics: Statics	
SEM 108	Innovative Manufacturing Seminar	
WLDR 152	Cutting Processes and Shielded Metal Arc Welding	
Semester 3		
MACH 109	Introduction to G-code	
MACH 110	Computer Numerical Control Lathe	
MACH 111	Computer Numerical Control Mill	
MACH 150	Milling Machine Operations	
MACH 151	Lathe Operations	
MANU 101	Introduction to Additive Manufacturing	
MANU 170	Manufacturing Materials	
WORK 169	Work Experience	
Semester 4		
CAM 200	Computer Aided Manufacturing 1	
CAM 201	Computer Aided Manufacturing 2	
HYDR 173	Fluid Power	
MANU 170	Manufacturing Processes and Systems	
MANU 205	Supply Chain Management	
MANU 206	Introduction to Robotics in Manufacturing	
MECH 161	Introduction to Robotics in Manufacturing	
PROJ 287	Project Management	
WLDR 154	Automation and Gas Metal Arc Welding	
Semester 5		

COURSE CODE	COURSE NAME	Delivered by another department/program
CAM 202	Computer Aided Manufacturing 3	
MACH 202	Multi Axis Machining	
MANU 207	Applications with Robotics in Manufacturing	
MANU 208	Operations Management	
PROJ 184	Project	
TCOM 104	Applied Research in Technology	Arts & Sciences
WLDR 155	Flux-Cored, Metal-Cored and Advanced Wire Feed Processes	
WLDR 157	Fabrication Equipment	

CAD 106 - Autodesk Inventor (3D)

This course will provide you with an understanding of the basic to intermediate functions of a Computer-Aided Design (CAD) software. Hands-on training and lecture sessions will provide you with the knowledge to create 3D models, assemblies, and drawings. You will learn about part and assembly modeling for use in real-world manufacturing settings.

Credit unit(s): 4.0
Co Requisites: DRFT 174
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Discuss user interface (UI).			
2. Create 2D dimensioned sketches with constraints.			
3. Create 3D models.			
4. Create assemblies.			
5. Create part drawings.			
6. Create assembly drawings.			

CLTR 200 - Culture and Diversity

Your studies will focus on the many dimensions of culture and approaches to promoting inclusion and innovation. You will explore culture in Canadian society as it pertains to Indigenous and immigrant populations. You will also examine the correlation between culture and diversity.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Discuss how cultural dimensions shape the diversity of Canada.			
2. Discuss the prominent dimensions of culture in Canadian society such as tradition, familial relations, and employment.			
3. Describe the interrelationships produced when the dimensions of various cultures interact.			
4. Describe the dimensions of culture as it relates to Indigenous and immigrant populations.			
5. Discuss the correlation between culture, diversity, and innovation.			

DRFT 174 - Drafting Principles

You will learn the basic theory and skills needed to generate graphic representation of an idea, concept, or entity. You will use engineering lettering and geometric construction to prepare engineering graphs with computer software. You will develop orthographic drawings, dimensioning, pictorial, auxiliary views, and sectional views.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Identify basic drafting concepts.			
2. Demonstrate engineering lettering.			
3. Use geometric construction.			
4. Generate engineering graphs.			
5. Produce orthographic drawings by free-hand sketching.			
6. Produce orthographic drawings.			
7. Dimension drawings.			
8. Construct pictorial drawings.			
9. Use descriptive geometry.			
10. Construct auxiliary view drawings.			
11. Construct sectional view drawings.			

ENGL 101 - Critical Reading and Writing

You will develop basic skills in critical analysis and effective reading by analyzing and evaluating materials from various disciplines. You will also refine your understanding and practice of the structures of composition by writing a research paper on a topic of your choice using APA-style.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Practice critical writing skills.			
2. Practice critical reading skills.			
3. Demonstrate persuasive writing strategies in the writing process.			
4. Evaluate research publications.			
5. Create a research paper on a chosen topic by applying critical reading, writing and research skills.			
6. Modify a research paper illustrating revision and editing skills			

MACH 108 - Machine Shop Fundamentals

You will safely set up, operate, and maintain various tools and drilling machines. You will use a drill press to acquire skill in the hole making process. You will perform various drilling operations.

Credit unit(s): 4.0
Co Requisites: MEAS 161
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Identify fasteners and non-cutting hand tools.			
2. Use metal cutting tools and power tools.			
3. Identify turning and milling machines and their uses.			
4. Examine manual lathes.			
5. Examine manual milling machines.			
6. Operate a drill press.			
7. Calculate feeds and speeds for different machine processes.			
8. Select work holding devices for drilling operations.			
9. Use drilling tools.			
10. Perform countersinking, counterboring and spotfacing.			
11. Cut threads.			
12. Service drilling machines.			

MATH 104 - Applied Mathematics

You will solve practical problems using arithmetic, linear equations, geometry, and right triangle trigonometry. You will manipulate and use some formulas related to your trade.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Solve practical problems involving arithmetic.			
2. Perform calculations with the Imperial and metric systems of measurement.			
3. Solve practical problems involving linear equations.			
4. Solve practical problems involving trade formulas.			
5. Solve practical problems involving geometry.			
6. Solve practical problems involving trigonometry.			

MEAS 161 - Precision Measurement and Tooling

You will be introduced to fundamental measuring systems and tools. You will practice precision measurements using a variety of measurement tools. You will operate a Coordinate Measuring Machine (CMM).

Credit unit(s): 4.0
Co Requisites: MACH 108
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Identify measurement systems.			
2. Use semi-precision measurement.			
3. Measure with Vernier calipers.			
4. Measure with micrometers.			
5. Use telescoping gauges and small hole gauges.			
6. Use adjustable parallels and dial indicators.			
7. Measure with precision instruments.			
8. Measure with universal bevel protractor.			
9. Use sine bar.			
10. Interpret Geometric Dimensioning and Tolerancing (GD&T).			
11. Use Coordinate Measuring Machine (CMM).			

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
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	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.			

COAP 172 - Computer Applications

You will receive an introduction to computer applications (such as a word processor, spreadsheet, and database application). You will also gain knowledge of electronic spreadsheets in detail.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Perform file management.			
2. Demonstrate an understanding of the purpose and characteristics of a word processing application.			
3. Demonstrate an understanding of the purpose and characteristics of a spreadsheet application.			
4. Use a variety of electronic spreadsheet functions to process information.			
5. Work with multiple worksheets in Microsoft Excel.			
6. Work with charts within Microsoft Excel.			
7. Use Excel to solve advanced numerical problems.			
8. Use Excel database functionality to store and manipulate data.			
9. Describe the purpose of a relational database management system.			

COM 170 - Professional Workplace Communication

You will be introduced to the basics of computer concepts. Topics you will study include computer components, hardware, and software, working in a graphical user interface, file management, word processing and the Internet. The general skills you learn in this course will prepare you for further courses such as word processing, spreadsheets and presentation graphics.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Work in a windows environment.			
2. Explain the basic operation of a computer.			
3. Perform file management.			
4. Use basic features of a word processor.			
5. Use the Internet to communicate and locate information.			

DRFT 177 - Mechanical Drafting

You will apply theoretical concepts from mechanics of materials to mechanical models. Drafting principles will be applied to applications such as mold and sheet metal design, stress and strain analysis and thermodynamic analysis to predict the performance of mechanical systems.

Credit unit(s): 3.0
Pre Requisites: CAD 106, DRFT 174
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Present mechanical designs with three-dimensional modeling software.			
2. Sketch models with advanced modelling techniques.			
3. Model sheet metal parts.			
4. Analyze stress and strain in materials.			
5. Illustrate stress and strain in mechanical designs.			
6. Illustrate heat transfer in materials.			
7. Model weldments.			
8. Design fixtures and jigs in manufacturing.			
9. Design molds.			

MACH 155 - Drilling Machine Operations

You will learn how to set up, operate and maintain various drilling machines. The course content includes drilling, reaming, tapping and boring operations.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Service drilling machines.			
2. Select feeds and speeds for drilling operations.			
3. Select work-holding devices for drilling operations.			
4. Identify drilling tools.			
5. Drill holes.			
6. Ream holes.			
7. Perform countersinking, counterboring and spotfacing.			
8. Power tap holes.			
9. Tap holes by hand on a drill press.			

MATH 167 - Applied Mathematics 2

Building on the arithmetic and algebraic skills you developed in Math 104 – Applied Mathematics 1 – you will apply trigonometry to vector problems, work with functions, and solve various types of equations.

Credit unit(s): 3.0
Pre-Requisites: MATH 104
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Perform vector addition.			
2. Examine single variable functions.			
3. Examine linear functions.			
4. Solve systems of linear equations.			
5. Solve quadratic equations.			
6. Solve exponential and logarithmic equations.			

MECH 160 - Applied Mechanics: Statics

You will use basic algebra, plane geometry and trigonometry to study the effect of forces acting on bodies in equilibrium. You will solve 2-dimensional and 3-dimensional problems in applied mechanics.

Credit unit(s): 3.0
Pre-Requisites: MATH 167
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Examine forces, vectors, and resultants.			
2. Calculate the magnitude and direction of moments and couples.			
3. Solve for unknown forces in two-dimensional equilibrium problems.			
4. Solve for unknown forces in static structures and machines.			
5. Solve for unknown forces in three-dimensional equilibrium problems.			
6. Solve for unknown forces in frictional equilibrium problems.			
7. Examine the centroid and centre of gravity of objects.			
8. Examine the moment of inertia for various objects.			

SEM 108 - Innovative Manufacturing Seminar

You will study creative and critical thinking in order to apply those skills to roles in the organization, and professional and personal situations. You will be analyzing information in order to respond to a wide variety of work and personal situations.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	<p>Competent</p>	<p>Learning</p>	<p>None</p>
<p>1. Define creative and critical thinking in relation to business and the role of a leader.</p>			
<p>2. Explain creative and critical thinking as it applies to decision making.</p>			
<p>3. Compare and contrast creative thinking.</p>			
<p>4. Apply creative and critical thinking skills to a given situation or problem.</p>			
<p>5. Develop strategies to improve creative and critical thinking skills for an individual or a team.</p>			

WLDR 152 - Cutting Processes and Shielded Metal Arc Welding

You will practice appropriate safety protocols and become familiar with shielded metal arc welding (SMAW) equipment, accessories, and consumables. You will perform basic SMAW welds.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Practice safety protocols.			
2. Cut plate and structural steel using the oxy-fuel cutting process.			
3. Cut ferrous and non-ferrous metals using the plasma arc cutting (PAC) manual process.			
4. Program the computer numerical control (CNC) plasma table.			
5. Describe shielded metal arc welding (SMAW) equipment, accessories, operation, and safety concerns.			
6. Set up a SMAW weld station.			
7. Select electrodes.			
8. Perform surface buildup using E7018.			
9. Weld 1/4-inch mild steel, horizontal, T-joint and fillet using E7018.			

WLDR 153 - Gas Metal Arc Welding 1

You will practice appropriate safety protocols and become familiar with Gas Metal Arc Welding (GMAW) equipment, accessories, and consumables. You will set up a weld station and perform basic GMAW welds.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Practice safety protocols.			
2. Describe gas metal arc welding (GMAW) equipment, accessories, operation, and safety concerns.			
3. Weld 14-gauge mild steel, horizontal, lap joint, fillet weld.			
4. Weld 14-gauge mild steel, vertical down, T-joint, 3-pass fillet weld.			
5. Perform surface buildup using spray transfer and ER70 electrode.			
6. Weld quarter-inch mild steel, horizontal, T-joint, and 3-pass fillet weld in spray transfer.			

MACH 109 - Introduction to G-code

You will learn about how and why to use G-code for a Computer Numerical Control (CNC) machine. You will study the basic uses of a CNC controller and how the controller uses G-code to perform different functions.

Credit unit(s): 1.0
Pre and 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 G-code on a CNC lathe.			
2. Explain G-code on a CNC mill.			
3. Explain the use of a CNC controller.			

MACH 110 - Computer Numerical Control Lathe

You will learn about the practices and principles for programming and operating a computer numerical control (CNC) lathe. You will write and run CNC programs to create parts on a 2-axis lathe.

Credit unit(s): 2.0
Pre Requisites: MAH 108
Co Requisites: MACH 109
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 principles, axes, and dimensioning of the computer numerical control (CNC) lathe.			
2. Use G-code to create CNC code for a CNC lathe.			
3. Examine machining process steps on a CNC lathe.			
4. Write a CNC program for a 2-axis CNC lathe.			
5. Run a CNC program on a 2-axis lathe.			

MACH 111 - Computer Numerical Control Mill

You will learn about the practices and principles for programming and operating a computer numerical control (CNC) mill. You will write and run CNC programs to create parts on a 3-axis milling machine.

Credit unit(s): 2.0
Pre Requisites: MACH 108
Co Requisites: MACH 109 or MACH 150
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Define the principles of the computer numerical control (CNC) milling machine.			
2. Define the axes and position dimensioning for a CNC mill.			
3. Use G-code to create CNC code for a CNC mill.			
4. Examine machining process steps on a CNC mill.			
5. Write a CNC program for a 3-Axis mill.			
6. Run a CNC program on a 3-axis mill.			

MACH 150 - Milling Machine Operations

You will safely set up, operate, and maintain various milling machines and attachments. Your studies will focus on selecting tools, holders, feed rates and speeds for various cutter and material applications.

Credit unit(s): 4.0
Pre-Requisites: MACH 108, MEAS 161
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Identify components of a vertical milling machine.			
2. Identify cutting tools and holders for a vertical milling machine.			
3. Examine setups and work holding on a vertical milling machine.			
4. Calculate speeds and feeds for milling machines.			
5. Discuss vertical milling machine operations.			
6. Perform vertical milling machine operations.			
7. Identify components of a horizontal milling machine.			
8. Identify cutting tools and holders for a horizontal milling machine.			
9. Examine setups and work holding on a horizontal milling machine.			
10. Perform horizontal milling machine operations.			
11. Operate indexing heads and rotary tables.			

MACH 151 - Lathe Operations

You will learn how to safely set up and operate manual lathes. You will practice turning, hole making, boring, grooving, internal and external threading.

Credit unit(s): 4.0
Pre-Requisites: MACH 108, MEAS 161
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Describe safe operation of manual lathes.			
2. Identify components of an engine lathe.			
3. Use lathe work holding devices.			
4. Identify cutting tools for a lathe.			
5. Perform face and center drill operations.			
6. Perform turning operations.			
7. Machine with carbide tooling.			
8. Perform grooving and parting operations.			
9. Perform drilling, tapping and reaming operations.			
10. Perform boring operations.			
11. Cut external threads.			
12. Cut internal threads.			

MANU 101 - Introduction to Additive Manufacturing

In this course you will be introduced to additive manufacturing (3D printing). Your lectures will consist of learning to create programs and settings in slicer software to generate G-code, while hands-on labs will show you how to calibrate and run a 3D printer.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Outline the principles of additive manufacturing.			
2. Use of slicer software for additive manufacturing.			
3. Simulate the use and setup of an additive manufacturing printer.			

MATE 170 - Manufacturing Materials

You will learn how to select appropriate materials for various manufacturing processes. You will identify ferrous and non-ferrous materials as well as ceramics, glass and polymers. You will perform heat treating processes and metal testing using various shop testing methods.

Credit unit(s): 3.0
Pre-Requisites: MACH 108
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Identify metals using numbering systems and structural shapes.			
2. Describe properties of ferrous and non-ferrous metals and alloys.			
3. Describe properties of non-metallic materials ceramic, glass, and polymers.			
4. Select materials for manufacturing processes.			
5. Describe work hardening of materials.			
6. Analyze fracture causes in manufacturing.			
7. Describe heat treatment processes.			
8. Apply heat treatment processes.			
9. Apply hardness testing procedures.			
10. Compare annealing, normalizing and stress-relieving procedures.			
11. Describe non-destructive and destructive testing procedures.			

WORK 169 - Work Experience

You will practice your technical workplace skills while maintaining industry-standard communication, safety, and quality expectations.

Credit unit(s): 0.0

Pre-Requisites: DRFT 177, MACH 155, MEAS 161, WLDR 153

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. Demonstrate workplace communication and interpersonal skills.			
2. Demonstrate effective work habits.			
3. Demonstrate safe working practices.			
4. Maintain quality assurance procedures.			

CAM 200 - Computer Aided Manufacturing 1

You will use computer software to draw and create 2D tool paths for computer numerical control (CNC) milling centers. You will simulate your tool paths on the computer and run your program on a CNC mill.

Credit unit(s): 3.0
Pre-Requisites: MACH 111, MACH 150
Co Requisite: CAM 201
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Configure the User Interface (UI) environment.			
2. Create 2D geometry and/or wireframes.			
3. Manipulate geometry and/or wireframes.			
4. Produce basic solid model.			
5. Prepare stock setup and tool library.			
6. Create 2D toolpaths for mill.			
7. Generate simulated toolpaths for machining.			
8. Operate machine center using post program.			

CAM 201 - Computer Aided Manufacturing 2

You will use computer software to draw and create 2D tool paths for computer numerical control (CNC) turning centers. You will simulate your tool paths on the computer and run your program on a CNC lathe.

Credit unit(s): 3.0
Pre-Requisites: MACH 151
Co Requisite: CAM 200
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Configure the User Interface (UI) environment.			
2. Create 2D geometry and/or wireframes.			
3. Manipulate geometry and/or wireframes.			
4. Produce basic solid model.			
5. Prepare stock setup and tool library.			
6. Create 2D toolpaths for lathe.			
7. Generate simulated toolpaths for machining.			
8. Operate machine center using post program.			

HYDR 173 - Fluid Power

You will be introduced to hydraulic and pneumatic systems and applications in manufacturing processes. Your studies will include pumps, motors, and valve systems. You will practice selecting appropriate components for hydraulic and pneumatic systems.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Discuss basic hydraulic systems.			
2. Discuss hydraulic system components.			
3. Use basic hydraulic concepts for manufacturing.			
4. Discuss basic pneumatic systems.			
5. Discuss pneumatic system components.			
6. Use basic pneumatic concepts.			

MANU 170 - Manufacturing Processes and Systems

You will be introduced to metal and plastic manufacturing. You will compare manufacturing processes and fabrication techniques as well as mold design and casting processes.

Credit unit(s): 4.0
Pre-Requisites: MACH 111, MATH 167
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Define manufacturing industries and processes.			
2. Analyze casting fundamentals.			
3. Compare metal casting processes.			
4. Define shaping processes for plastics.			
5. Discuss mold design for manufacturing processes.			
6. Analyze metal forming fundamentals.			
7. Define bulk deformation processes.			
8. Define sheet metal processes.			
9. Define additive manufacturing processes.			

MANU 205 - Supply Chain Management

You will study supply chains with respect to manufacturing. You will discuss procurement, e-procurement, and distribution. You will predict product demand and optimize supply. You will also identify how lean systems such as cellular layouts in manufacturing environments create value.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Analyze supply chain management principles.			
2. Calculate accurate business forecasts.			
3. Discuss key elements of inventory management.			
4. Calculate optimal order and production quantities.			
5. Analyze material requirements planning for use in manufacturing.			
6. Describe lean systems.			

MANU 206 - Introduction to Robotics in Manufacturing

Your studies will consist of learning about the applications and implementation of robotics in manufacturing. You will learn about the components and programming of a robot. You will also use hands-on labs to practice manipulating a robotic arm and use problem solving skills to create robotic programs.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Examine industrial robots in manufacturing.			
2. Explain the components of a robotics system.			
3. Manipulate the movement of a robotic arm.			
4. Practice calibration of robotic components.			
5. Create a robotic program.			
6. Execute robotic programs.			

MECH 161 - Applied Mechanics: Dynamics

Your studies will focus on kinematics and kinetics. In kinematics, you will examine the geometry of rectilinear, circular and general plane motions. In kinetics, you will solve for the forces associated with motion using dynamic equilibrium, work, energy and power and impulse-momentum. You will learn how to solve applied problems using Newton's three laws of motion. You will also study linkage mechanisms and their motion.

Credit unit(s): 3.0
Pre-Requisites: MECH 160
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Examine rectilinear motion of bodies.			
2. Examine angular motion of bodies.			
3. Solve for velocity, distance, and acceleration of moving bodies in plane motion.			
4. Describe Newton's three laws of motion. to describe inertia.			
5. Solve for work, energy, and power in dynamic problems.			
6. Solve for impulse and momentum in dynamic problems.			
7. Discuss mechanical vibration.			

PROJ 287 - 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 in a variety of projects. You will practice skills using project management software.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Discuss project management concepts.			
2. Explain the process to initiate a project.			
3. Create a project plan using project management software.			
4. Explain the methods used to execute a project plan.			
5. Explain monitoring requirements of a project.			
6. Discuss closing requirements of a project.			

WLDR 154 - Automation and Gas Metal Arc Welding

You will practice appropriate safety protocols and apply gas metal arc welding (GMAW) to the certified CWB 1GF weldment exam. You will practice appropriate safety protocols and apply GMAW to the automated welding processes.

Credit unit(s): 4.0
Pre-Requisites: WLDR 153
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Practice safety protocols.			
2. Weld flat-groove fillet (1GF).			
3. Describe process, cells, fixtures, uses.			
4. Describe programming of the robot to follow sled parameters.			
5. Perform fixture development and layout.			
6. Perform welding as per specified CAD file and design.			

CAM 202 - Computer Aided Manufacturing 3

You will use computer software to draw and create 3D tool paths for computer numerical control (CNC) milling centers. This includes advanced surfacing and high-speed roughing techniques. You will simulate your tool paths on the computer and run your program on a CNC mill.

Credit unit(s): 3.0
Pre-Requisites: CAM 200, CAM 201
Co Requisites: MACH 202
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Create advanced 3D geometry and/or wireframes.			
2. Manipulate geometry and/or wireframes.			
3. Produce advanced solid models and surfaces.			
4. Import toolpaths and models.			
5. Prepare stock setup and tool library.			
6. Produce advanced Work Coordinate Systems (WCS) for 3D milling.			
7. Create advanced 3D toolpaths for mill.			
8. Generate simulated toolpaths for machining.			
9. Operate machine center using post programs.			

MACH 202 - Multi Axis Machining

You will learn how to set up and program a computer numerical control (CNC) multi-axis machining center. This includes 4th and 5th axis, along with a live tooling lathe. You will simulate your toolpaths on the computer and run your program on a CNC multi-axis machining center.

Credit unit(s): 3.0
Pre-Requisites: CAM 200, CAM 201
Co Requisites: CAM 202
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Create advance 3D geometry and/or wireframes.			
2. Manipulate geometry and/or wireframes.			
3. Produce advance solid models and surfaces.			
4. Create advanced 4th axis toolpaths.			
5. Create advanced live tooling toolpaths.			
6. Create advanced multi-axis toolpaths.			
7. Generate toolpaths for machining centers.			
8. Operate multi-axis machine centers using post programs.			

MANU 207 - Applications with Robotics in Manufacturing

You will use the skills you have learnt in previous courses to solve robotic manufacturing processes. You will then use your solution to create a project using the different manufacturing skills you have acquired.

Credit unit(s): 3.0
Pre-Requisites: MANU 206
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Analyze manufacturing problems for robotics.			
2. Design jig and fixtures for robotic manufacturing.			

MANU 208 - Operations Management

You will learn operations, quality, and process management concepts. Your studies will focus on quality assurance in a manufacturing environment. This includes a study of quality control and an introduction to Six Sigma and Lean Six Sigma. You will become familiar with the statistical sampling and analysis tools used to achieve and verify quality goals.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Explain basic quality concepts.			
2. Analyze the cost of quality.			
3. Discuss quality from the perspective of a producer and consumer.			
4. Examine quality management systems.			
5. Discuss quality awards, standards, and certifications.			
6. Analyze quality using statistical process control.			
7. Evaluate acceptance based on inspection results.			
8. Analyze product design.			
9. Design for quality.			
10. Examine process management.			
11. Design facility layout.			
12. Practice work sampling.			

PROJ 184 - Project

You will plan, develop, research, execute and present a manufacturing project. Your studies will also include consideration of contract law and documentation.

Credit unit(s): 4.0
Pre-Requisites: DRFT 177, HYDR 173, MACH 108, MANU 205, MATE 170, MECH 161, WLDR 153
Co Requisites: CAM 202, MANU 208, TCOM 104, WLDR 157
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Select an industrial project.			
2. Conduct a feasibility study on alternate solutions.			
3. Create a solution to an industrial project.			
4. Prepare a set of working drawings.			
5. Produce a technical report.			
6. Outline project solutions in an oral presentation.			
7. Describe the role of each member of the engineering team.			
8. Recognize how Canadian law affects contracts and liabilities.			
9. Explain the function of contract documents.			

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: ENGL 101
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	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.			

WLDR 155 - Flux-Cored, Metal-Cored and Advanced Wire Feed Processes

You will practice appropriate safety protocols and apply flux-cored arc welding (FCAW) and metal-cored arc welding (MCAW) in welding mild steel. You will also continue your gas metal arc welding (GMAW) studies in welding aluminum and advanced wave form processes.

Credit unit(s): 3.0
Pre-Requisites: WLDR 154
Equivalent course(s): none

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Practice safety protocols.			
2. Weld 1/4-inch aluminum, horizontal, T-joint, fillet weld.			
3. Weld 3/8-inch mild steel, horizontal, T-joint, fillet weld, 3-pass using flux-cored arc welding (FCAW).			
4. Weld 3/8-inch mild steel, horizontal, T-joint, fillet weld, 3-pass using metal-cored arc welding (MCAW).			
5. Perform advanced wave form welding.			

WLDR 157 - Fabrication Equipment

You will practice appropriate safety protocols and study the application and operation of fabrication equipment including press brake, shear, plate rolls, structural rolls and other metal forming tools. You will apply your skills by completing a welding and fabrication project.

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

<p>Use a checkmark (✓) to rate yourself as follows for each learning outcome</p> <p>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.</p>	Competent	Learning	None
1. Practice safety protocols.			
2. Operate a manual press brake.			
3. Operate a computer numerical control (CNC) press brake.			
4. Operate plate rolls.			
5. Operate profile roller.			
6. Operate manual and programmable saws.			
7. Operate iron worker.			
8. Operate pipe notcher and coper.			
9. Fabricate a project using selected welding process.			