



8857

APPLIED MACHINING AND
MANUFACTURING TECHNOLOGY
(12C)

40S/40E/40M

A Machining Technology Course

8857: APPLIED MACHINING AND MANUFACTURING TECHNOLOGY (12C) 40S / 40E / 40M

Course Description

Students apply their skills and knowledge to machine projects in a safe, efficient, and responsible manner to industry standards using available machine shop tools. Emphasis is placed upon preparing students to meet the level of skill and knowledge expected of a first-year apprentice. Work experience is most often included as part of this course.

Goal 1: Describe and apply appropriate **health and safety** practices as they relate to the **maintenance of a safe workplace.**

GLO 1.1: Create and maintain a **safe working environment** in machining technology.

- SLO 12C.1.1.1 Identify safety and health requirements. (A1.1)
- SLO 12C.1.1.2 Identify personal protective equipment (PPE) and PPE procedures. (A1.2)
- SLO 12C.1.1.3 Identify appropriate safety procedures for working with electricity. (A1.3)
- SLO 12C.1.1.4 Identify appropriate safety procedures to reduce fire hazards. (A1.4)
- SLO 12C.1.1.5 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain). (A1.5)
- SLO 12C.1.1.6 Identify hazard recognition and control. (A1.6)
- SLO 12C.1.1.7 Describe the hazards of confined-space entry. (A1.7)
- SLO 12C.1.1.8 Identify first aid/cardiopulmonary resuscitation (CPR). (A1.8)
- SLO 12C.1.1.9 Identify safety requirements as they apply to the WHMIS. (A1.9)
- SLO 12C.1.1.10 Describe the identification and control of specified hazards. (A1.10)
- SLO 12C.1.1.11 Identify types of personal protective equipment (PPE), and describe their applications. (A2.1)
- SLO 12C.1.1.12 Describe the procedures used to care for and maintain PPE. (A2.2)
- SLO 12C.1.1.13 Identify types of fire extinguishing equipment, and describe their applications and procedures for use. (A2.3)

- SLO 12C.1.1.14 Identify workplace hazards, and describe safe work practices and equipment. (A2.4)
- SLO 12C.1.1.15 Identify and interpret workplace safety and health regulations. (A2.4)
- SLO 12C.1.1.16 Identify hazards, and describe safe work practices pertaining to fluids and coolants. (A8.2)
- SLO 12C.1.1.17 Identify hazards, and describe safe work practices pertaining to hand and power tools. (B1.1)
- SLO 12C.1.1.18 Demonstrate understanding and adherence to safe work procedures/job hazards analysis documents for each piece of equipment, tool, and consumable that they use.
- SLO 12C.1.1.19 Demonstrate understanding and adherence to safe practices and procedures for facilities, processes, tools, and equipment found in machining technology.
- SLO 12C.1.1.20 Discuss worker's responsibility to refuse unsafe work.
- SLO 12C.1.1.21 Demonstrate use of personal protective equipment (PPE) and adherence to PPE procedures used in machining technology.
- SLO 12C.1.1.22 Demonstrate the safe use of compressed air.
- SLO 12C.1.1.23 Practise appropriate cleaning and maintenance of the machining technology area and equipment for the promotion of a safe work/learning environment.
- SLO 12C.1.1.24 Practise appropriate safe behaviour to ensure personal safety, as well as the safety of others.
- SLO 12C.1.1.25 Develop safe habits.
- SLO 12C.1.1.26 Demonstrate a safe, clean, organized, and uncluttered work area.
- SLO 12C.1.1.27 Explain the purpose/importance and use of accident report forms.
- SLO 12C.1.1.28 Identify hazards, and describe safe work practices pertaining to hoisting, lifting, and rigging. (A5.2)
- SLO 12C.1.1.29 Demonstrate an understanding of the importance of machining equipment.
- SLO 12C.1.1.30 Practise safe set-up/operation of machining tools used.

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual.**

(www.gov.mb.ca/tce/apprent/apprentice/trade_safety/)

No applicable SLOs.

Goal 2: Understand **terminology, abbreviations, symbols, and acronyms** related to machining technology.

GLO 2.1: Understand **terminology, abbreviations, symbols, and acronyms** related to machining technology.

- SLO 12C.2.1.1 Define metallurgical terminology, abbreviations, symbols, and acronyms.
- SLO 12C.2.1.2 Define terminology, abbreviations, symbols, and acronyms associated with lean manufacturing.
- SLO 12C.2.1.3 Define terminology associated with hoisting, lifting, and rigging. (A5.1)
- SLO 12C.2.1.4 Define terminology, abbreviations, symbols, and acronyms associated with fluids and coolants. (A8.1)

Goal 3: Understand **technical drawings.**

GLO 3.1: Understand **technical drawings.**

- SLO 12C.3.1.1 Produce basic paper-and-pencil sketch of project.
- SLO 12C.3.1.2 Interpret and extract information from drawings. (A6.3)
- SLO 12C.3.1.3 Identify dimensions found on drawings
- SLO 12C.3.1.4 Identify tolerances found on drawings.

Goal 4: Demonstrate **layout and planning.**

GLO 4.1: Demonstrate **planning and layout procedures.**

- SLO 12C.4.1.1 Calculate layout dimensions and reference points. (C3.4)
- SLO 12C.4.1.2 Use layout tools for projects and assignments.
- SLO 12C.4.1.3 Use planning worksheets for projects.

GLO 4.2: Demonstrate **layout on projects.**

- SLO 12C.4.2.1 Identify and use tools required to perform advanced layout on projects.
- SLO 12C.4.2.2 Perform basic layout. (C3.9)
- SLO 12C.4.2.3 Use sine bar.

Goal 5: Use measurement and quality control tools.**GLO 5.1: Use measurement and quality control tools.**

- SLO 12C.5.1.1 Describe the procedures used to read basic precision measuring instrument scales. (C1.3)
- SLO 12C.5.1.2 Use surface plates.
- SLO 12C.5.1.3 Use gauge blocks.
- SLO 12C.5.1.4 Calibrate measuring tools.

Goal 6: Identify basic elements of metallurgy.**GLO 6.1: Identify basic elements of metallurgy.**

- SLO 12C.6.1.1 Identify the effects on cutting tools for different metals.
- SLO 12C.6.1.2 Identify physics of metal cutting.
- SLO 12C.6.1.3 Identify heat treatment.
- SLO 12C.6.1.4 Identify heat treatment processes.

Goal 7: Understand tools, equipment, and accessories.**GLO 7.1: Identify tools, equipment, accessories, and work-holding devices.**

- SLO 12C.7.1.1 Identify types of fluids and coolants, and describe their purpose, characteristics, and applications. (A8.4)
- SLO 12C.7.1.2 Interpret regulations pertaining to the use of fluids and coolants. (A8.3)
- SLO 12C.7.1.3 Identify types of rigging equipment and accessories, and describe their applications, limitations, and procedures for use. (A5.4)
- SLO 12C.7.1.4 Identify and interpret hand signals used for hoisting and lifting. (A5.5)
- SLO 12C.7.1.5 Identify types of hoisting and lifting equipment and accessories, and describe their applications, limitations, and procedures for use. (A5.6).
- SLO 12C.7.1.6 No applicable SLO.

GLO 7.2: Use tools, equipment, accessories, and work-holding devices.

- SLO 12C.7.2.1 Describe the procedures used to apply cutting fluids and coolants. (A8.7)
- SLO 12C.7.2.2 Describe the considerations when rigging material/equipment for lifting. (A5.7)

- SLO 12C.7.2.3 Describe the procedures used to inspect, maintain, and store hoisting, lifting, and rigging equipment. (A5.8)
- SLO 12C.7.2.4 Perform procedures used to inspect, maintain, and store hoisting, lifting, and rigging equipment. (A5.9)
- SLO 12C.7.2.5 Describe the procedures used to handle, store, and dispose of fluids and coolants. (A8.9)
- SLO 12C.7.2.6 Perform procedures used for mixing, maintaining, and adjusting coolants. (A8.6)
- SLO 12C.7.2.7 Machine a plate with a bolt-hole circle.
- SLO 12C.7.2.8 Machine a sleeve to shrink-fit onto a shaft.
- SLO 12C.7.2.9 Machine a shaft to accommodate a bearing.
- SLO 12C.7.2.10 Machine an external O-ring groove.
- SLO 12C.7.2.11 Machine an internal O-ring groove.
- SLO 12C.7.2.12 Machine project with mating threads.
- SLO 12C.7.2.13 Machine a student-initiated project.

GLO 7.3: Identify techniques used to **troubleshoot** and **predict potential problems**.

- SLO 12C.7.3.1 Identify potential set-up problems, and describe their causes and solutions.
- SLO 12C.7.3.2 Identify techniques used to troubleshoot machining operations, and describe their associated procedures.

Goal 8: Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to machining technology.

GLO 8.1: Apply **mathematical knowledge and skills** related to machining technology.

- SLO 12C.8.1.1 Solve problems involving fractions and decimals.
- SLO 12C.8.1.2 Solve problems involving metric and imperial measure.
- SLO 12C.8.1.3 Solve problems involving length, perimeter, circumference, volume, area, mass, angles, ratio, and percentage.
- SLO 12C.8.1.4 Convert between imperial and metric measurements.
- SLO 12C.8.1.5 Use formulas to accurately calculate data for use in machining operations.
- SLO 12C.8.1.6 Accurately calculate and measure parts and angles.
- SLO 12C.8.1.7 Perform mathematical calculations, conversions, and measurements, as required for the project.
- SLO 12C.8.1.8 Perform product estimation techniques, including material and labour costs.

SLO 12C.8.1.9	Problem-solve for missing dimensions on an engineering drawing.
SLO 12C.8.1.10	Calculate right-angle trigonometry problems.
SLO 12C.8.1.11	Calculate weight reduction between pre-machined and post-machined parts.
SLO 12C.8.1.12	Use charts and reference books to determine tap drill sizes.
SLO 12C.8.1.13	Use charts and reference books to determine conversions among metric, fractional, and decimal units of measurement.
SLO 12C.8.1.14	Use charts and reference books to obtain data for use in machining operation calculations.

Goal 9: Demonstrate an awareness of **education and career opportunities** in machining technology and associated occupations.

GLO 9.1: Describe **education and career opportunities** in machining technology

SLO 12C.9.1.1	Explain journeyman certification requirements.
SLO 12C.9.1.2	Describe special opportunities and challenges re: machinist training. (A3.3)

Goal 10: Describe the **history, technological progression, and emerging trends** in machining technology.

GLO 10.1: Describe the **history, technological progression, and emerging trends** in machining technology.

SLO 12C.10.1.1	Discuss lean manufacturing.
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Goal 11: Demonstrate **employability skills** related to machining technology.

GLO 11.1: Demonstrate **employability skills** related to machining technology.

SLO 12C.11.1.1	Demonstrate regular attendance and punctuality.
SLO 12C.11.1.2	Demonstrate accountability by taking responsibility for their actions.
SLO 12C.11.1.3	Demonstrate adaptability and effort.
SLO 12C.11.1.4	Demonstrate the ability to accept and follow directions and listen to feedback.

- SLO 12C.11.1.5 Demonstrate the ability to stay on task and make effective use of time in class and shop environments.
 - SLO 12C.11.1.6 Demonstrate the ability to communicate respectfully and effectively.
 - SLO 12C.11.1.7 Demonstrate being responsible to oneself and to the facility.
 - SLO 12C.11.1.8 Demonstrate behaviour appropriate to the workplace.
 - SLO 12C.11.1.9 Demonstrate neat personal appearance and proper hygiene.
 - SLO 12C.11.1.10 Prepare/revise a personal resumé specific to an application to an employer of machinists.
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Goal 12: Demonstrate awareness of the **ethical and legal standards** as they pertain to machining technology.

GLO 12.1: Demonstrate awareness of the **ethical and legal standards** as they pertain to machining technology.

- SLO 12C.12.1.1 Discuss the relationship between ethics and employability skills, such as creating a respectful workplace and demonstrating a strong work ethic.
 - SLO 12C.12.1.2 Identify codes and regulations pertaining to rigging, hoisting, and lifting. (A5.3)
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Goal 13: Demonstrate awareness of **sustainability** as it pertains to machining technology.

GLO 13.1: Demonstrate awareness of **human sustainability** on machinists.

- SLO 12C.13.1.1 Discuss the importance to employers of having a sustainable workforce.
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GLO 13.2: Describe machining technology's sustainability practices and impact on the environment.

- SLO 12C.13.2.1 Discuss and demonstrate appropriate recycling, reduction of waste, and reusing of materials as they pertain to the machining industry.
 - SLO 12C.13.2.2 Discuss and demonstrate the appropriate disposal of coolants, oils, and non-recyclable waste.
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GLO 13.3: Demonstrate awareness of the **business sustainability** of a machining technology facility.

- SLO 12C.13.3.1 Discuss why businesses need to keep up with emerging trends and technology.

