8855
Lathe Operations and Grinding II (12A)

40S/40E/40M

A Machining Technology Course

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Course Description

Students further develop skills and knowledge necessary to select, operate, and maintain tools, as well as to perform calculations, interpret engineering drawings, work set-up, and machine material in a safe, efficient, and responsible manner through the application of practical projects related to the operation of the conventional lathe and offhand grinding. Emphasis is placed upon taper calculation and taper turning. Identification, selection, and use of carbide cutting tools are presented to drive the students' knowledge and curiosity to more advanced levels. Offhand grinding is taught to shape and maintain high-speed steel cutters for use in general or special turning applications. Opportunity may also be taken to further introduce CNC lathe machines and CNC theory.

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

SLO 12A.1.1.12	Describe the procedures used to care for and maintain PPE. (A2.2)
SLO 12A.1.1.13	Identify types of fire extinguishing equipment, and describe their applications and procedures for use. (A2.3)
SLO 12A.1.1.14	Identify workplace hazards, and describe safe work practices and equipment. (A2.4)
SLO 12A.1.1.15	Identify and interpret workplace safety and health regulations. (A2.4)
SLO 12A.1.1.16	Identify hazards, and describe safe work practices pertaining to fluids and coolants. (A8.2)
SLO 12A.1.1.17	Identify hazards, and describe safe work practices pertaining to hand and power tools. (B1.1)
SLO 12A.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 12A.1.1.19	Demonstrate understanding and adherence to safe practices and procedures for facilities, processes, tools, and equipment found in machining technology.
SLO 12A.1.1.20	Discuss worker's responsibility to refuse unsafe work.
SLO 12A.1.1.21	Demonstrate use of personal protective equipment (PPE) and adherence to PPE procedures used in machining technology.
SLO 12A.1.1.22	Demonstrate the safe use of compressed air.
SLO 12A.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 12A.1.1.24	Practise appropriate safe behaviour to ensure personal safety, as well as the safety of others.
SLO 12A.1.1.25	Develop safe habits.
SLO 12A.1.1.26	Demonstrate a safe, clean, organized, and uncluttered work area.
SLO 12A.1.1.27	Explain the purpose/importance and use of accident report forms.
SLO 12A.1.1.28	Identify hazards, and describe safe work practices pertaining to grinding machines. (F1.2)
SLO 12A.1.1.29	Identify precautions related to the operation of grinding machines.
SLO 12A.1.1.30	Practise safe set-up/operation of lathes and grinding machines.

GLO 1.2: Demonstrate knowledge of the **Trade Safety Awareness Manual**. (www.gov.mb.ca/tce/apprent/apprentice/trade_safety/)

SLO 10.1.2.1	Explain the importance of trade safety and health in reducing injuries and fatalities to young employees in Manitoba. (TSA 1)
SLO 10.1.2.2	Describe the rights and responsibilities of employees, employers, and supervisors under the *Workplace Safety and Health Act.* (TSA 2)
SLO 10.1.2.3	Describe the steps to use in the Right to Refuse process. (TSA 3)
SLO 10.1.2.5	Demonstrate how to handle a potentially dangerous work situation. (TSA 5)
SLO 10.1.2.6	Explain the S.A.F.E. acronym. (TSA 6)
SLO 10.1.2.7	Define workplace safety and health hazards. (TSA 7)
SLO 10.1.2.8	Give examples of trade-specific workplace safety and health hazards. (TSA 8)
SLO 10.1.2.9	Give examples of five types of safety and health hazards. (TSA 9)
SLO 10.1.2.10	Define workplace safety and health risks. (TSA 10)
SLO 10.1.2.11	Give examples of trade-specific workplace safety and health risks. (TSA 11)
SLO 10.1.2.12	Explain the principles of hazard recognition and control as they apply to the specific trade. (TSA 12)
SLO 10.1.2.13	Match the WHMIS hazardous materials symbols and their meanings. (TSA 14)
SLO 10.1.2.14	Describe the importance of the Material Safety Data Sheets (MSDS). (TSA 15)
SLO 10.1.2.15	Demonstrate proper selection and use of a variety of personal protective equipment and fall protection systems. (TSA 17)

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 12A.2.1.1	Define metallurgical terminology, abbreviations, symbols, and acronyms.
SLO 12A.2.1.2	Define terminology, abbreviations, symbols, and acronyms associated with grinding machines. (F1.1)
SLO 12A.2.1.3	Define terminology, abbreviations, symbols, and acronyms associated with conventional lathes. (D1.1)
SLO 12A.2.1.4	Define *work ethic* as it pertains to machining.

Goal 3: Understand **technical drawings.**

GLO 3.1: Understand **technical drawings**.

SLO 12A.3.1.1	Produce basic paper-and-pencil sketch of project.
SLO 12A.3.1.2	Interpret and extract information from drawings. (A6.3)
SLO 12A.3.1.3	Identify types of basic drawings and sketches, and describe their purpose. (A6.2)
SLO 12A.3.1.4	Describe basic sketching techniques. (A6.5)

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

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

SLO 12A.4.1.1	Calculate layout dimensions and reference points. (C3.4)
SLO 12A.4.1.2	Describe the procedures used to read and transfer sizes from a drawing. (C3.5)
SLO 12A.4.1.3	Use planning worksheets for projects.

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

SLO 12A.4.2.1	Identify and use tools required to perform advanced layout on lathe projects.
SLO 12A.4.2.2	Perform basic layout. (C3.9)
SLO 12A.4.2.3	Use centring head from combination square set.

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

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

SLO 12A.5.1.1	Describe the procedures used to perform basic calibration of measuring instruments. (C1.5)
SLO 12A.5.1.2	Use fixed gauges.
SLO 12A.5.1.3	Use three-wire method of measuring threads.
SLO 12A.5.1.4	Measure internal diameters.

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

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

SLO 12A.6.1.1	Distinguish metallurgical processes.
SLO 12A.6.1.2	Describe metals by physical characteristics.
SLO 12A.6.1.3	Describe metals by chemical characteristics.
SLO 12A.6.1.4	Describe metals by mechanical characteristics.

Goal 7: Understand **tools, equipment, and accessories.**

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

SLO 12A.7.1.1	Identify carbide cutting tools.
SLO 12A.7.1.2	Identify types of work-holding devices, and describe their applications. (F1.3)
SLO 12A.7.1.3	Identify types of grinding machines and accessories, and describe their applications. (F1.4)
SLO 12A.7.1.4	Identify types of work-holding devices, and describe their applications. (D1.6)
SLO 12A.7.1.5	Identify types of conventional lathe tools, and describe their characteristics and applications. (D1.7)
SLO 12A.7.1.6	Identify types of boring tools, and describe their applications and procedures for use. (D3.2).

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

SLO 12A.7.2.1	Describe the procedures used to perform offhand (bench) grinding operations. (F1.5)
SLO 12A.7.2.2	Perform offhand (bench) grinding operations. (F1.6)
SLO 12A.7.2.3	Describe the procedures used to perform special (form) grinding operations. (F1.7)

SLO 12A.7.2.4 Perform procedures for changing and dressing a grinding wheel. (F1.8)

SLO 12A.7.2.5 Describe the procedures used to mount and adjust rests. (D2.6)

SLO 12A.7.2.6 Describe the procedures used to adjust and maintain conventional lathes. (D2.9)

SLO 12A.7.2.7 Describe the procedures used to align lathe centres. (D2.10)

SLO 12A.7.2.8 Describe the procedures used to perform basic conventional lathe operations. (D2.11)

SLO 12A.7.2.9 Describe the procedures used for tapping on a conventional lathe. (D3.7)

SLO 12A.7.2.10 Describe the procedures used for die threading on a conventional lathe. (D3.8)

SLO 12A.7.2.11 Describe the procedures used for counterboring and countersinking work on a conventional lathe. (D3.9)

SLO 12A.7.2.12 Describe speed, feed, and depth of cut for conventional lathe operations. (D3.10)

SLO 12A.7.2.13 Perform processes for speed, feed, and depth of cut for conventional lathe operations. (D3.11)

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

SLO 12A.7.3.1 Identify potential grinding machine set-up problems, and describe their causes and solutions.

SLO 12A.7.3.2 Identify techniques used to troubleshoot grinding machine 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 12A.8.1.1 Solve problems involving fractions and decimals.

SLO 12A.8.1.2 Solve problems involving metric and imperial measure.

SLO 12A.8.1.3 Solve problems involving length, perimeter, circumference, volume, area, mass, angles, ratio, and percentage.

SLO 12A.8.1.4 Convert between imperial and metric measurements.

SLO 12A.8.1.5 Use formulas to accurately calculate data for use in machining operations.

SLO 12A.8.1.6	Accurately calculate and measure parts and angles.
SLO 12A.8.1.7	Perform mathematical calculations, conversions, and measurements, as required for the project.
SLO 12A.8.1.8	Calculate taper per foot and angle of taper.
SLO 12A.8.1.9	Calculate a taper accurately using the tailstock offset method.
SLO 12A.8.1.10	Demonstrate an understanding of right-angle trigonometry.
SLO 12A.8.1.11	Calculate machine setup to turn a #3 Morse taper.
SLO 12A.8.1.12	Use charts and reference books to determine tap drill sizes.
SLO 12A.8.1.13	Use charts and reference books to determine conversions among metric, fractional, and decimal units of measurement.
SLO 12A.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 12A.9.1.1	Discuss high school apprenticeship option.
SLO 12A.9.1.2	Discuss post-secondary opportunities that complement the skills of a machinist.

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 12A.10.1.1	Discuss emerging trends in machining of materials.

Goal 11: Demonstrate **employability skills** related to machining technology.

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

SLO 12A.11.1.1	Demonstrate regular attendance and punctuality.
SLO 12A.11.1.2	Demonstrate accountability by taking responsibility for their actions.
SLO 12A.11.1.3	Demonstrate adaptability and effort.

SLO 12A.11.1.4 Demonstrate the ability to accept and follow directions and listen to feedback.

SLO 12A.11.1.5 Demonstrate the ability to stay on task and make effective use of time in class and shop environments.

SLO 12A.11.1.6 Demonstrate the ability to communicate respectfully and effectively.

SLO 12A.11.1.7 Demonstrate being responsible to oneself and to the facility.

SLO 12A.11.1.8 Demonstrate behaviour appropriate to the workplace.

SLO 12A.11.1.9 Demonstrate neat personal appearance and proper hygiene.

SLO 12A.11.1.10 Prepare/revise a personal resumé specific to an application to an employer of machinists.

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 12A.12.1.1 Discuss ethical concerns in the machining industry as they relate to safety.

SLO 12A.12.1.2 Discuss ethical and legal considerations related to poor quality materials and workmanship.

Goal 13: Demonstrate awareness of **sustainability** as it pertains to machining technology.

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

SLO 12A.13.1.1 Discuss sustainable factors in the machining industry that influence the health and well-being of machinists.

GLO 13.2: Describe machining technology's sustainability practices and impact on the environment.

SLO 12A.13.2.1 Discuss and demonstrate appropriate recycling, reduction of waste, and reusing of materials as they pertain to the machining industry.

SLO 12A.13.2.2 Discuss and demonstrate the appropriate disposal of coolants, oils, and non-recyclable waste.

GLO 13.3: Demonstrate awareness of the **business sustainability** of a machining technology facility.

SLO 12A.13.3.1 Discuss why businesses seek out and find new business opportunities.