

Western Technical College

31420322 CNC Lathe Operation-Intermediate

Course Outcome Summary

Course Information

Description	Conversational programming and an introduction to G & M code programming of CNC (Computer Numerical Control) turning centers and lathes. Program prove-out for production of parts.
Career Cluster	Manufacturing
Instructional Level	Technical Diploma Courses
Total Credits	1.00

Textbooks

420-310 CNC Programming Manual Machine Tool. Western. Publisher: Western. Required.

Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** Campus Shop. Required.

Proper work boots - \$35.00-75.00. **Vendor:** To be discussed in class. Required.

Scientific calculator (recommend T1-36x Solar). **Vendor:** Campus Shop. Required.

Three-ring binder. **Vendor:** Campus Shop. Required.

Clipboard. **Vendor:** Campus Shop. Required.

Pens/Pencils. **Vendor:** Campus Shop. Required.

Core Abilities

- 1. Apply mathematical concepts.**
- 2. Demonstrate ability to think critically.**
- 3. Demonstrate ability to value self and work ethically with others in a diverse population.**
- 4. Make decisions that incorporate the importance of sustainability.**

5. **Transfer social and natural science theories into practical applications.**
6. **Use effective communication skills.**
7. **Use technology effectively.**

Course Competencies

1. Interpret basic CNC turning machine programs

Assessment Strategies

- 1.1. In the classroom, lab, or shop setting
- 1.2. Using interactive computer software and/or actual CNC machine tools
- 1.3. In written and applied assignments
- 1.4. Individually
- 1.5. On tests and quizzes
- 1.6. Given program examples, templates, materials, and all available shop equipment and supplies

Learning Objectives

- 1.a. Identify common G&M codes
- 1.b. Identify common conversational program codes
- 1.c. Explain the elements of a program block
- 1.d. Describe the actions the CNC turning machine performs for a block of code
- 1.e. Explain "modal"
- 1.f. Describe the three main CNC machine movements
- 1.g. Describe the main function of G codes
- 1.h. Describe the main function of M codes
- 1.i. Describe the purpose of sequence numbers
- 1.j. Follow a CNC program "road map"

2. Apply machining principles when writing programs

Assessment Strategies

- 2.1. In the classroom, lab, or shop setting
- 2.2. In written and applied assignments
- 2.3. Individually
- 2.4. On tests and quizzes
- 2.5. Given blank process sheets, templates, references and all available shop equipment and supplies

Learning Objectives

- 2.a. Determine order of operations for CNC turning programs
- 2.b. Determine depth of cut for each CNC turning tool
- 2.c. Determine feedrate and speed for each CNC turning tool operation
- 2.d. Select tooling for each CNC turning program operation
- 2.e. Determine workholding requirements for CNC turning program applications
- 2.f. Determine coordinate locations relative to machine position
- 2.g. Create an operation process plan
- 2.h. Create a setup process plan
- 2.i. Create a quality inspection plan

3. Write basic G&M code programs on a computer

Assessment Strategies

- 3.1. In the classroom, lab, or shop setting
- 3.2. Using computers and actual CNC machine tools
- 3.3. In written and applied assignments
- 3.4. Individually
- 3.5. On tests and quizzes

- 3.6. Given prints, diagrams, process sheets, materials, and all available shop equipment and supplies

Learning Objectives

- 3.a. Use a template to write a simple G&M code program
- 3.b. Use a print to write a simple G&M code program
- 3.c. Verify programs on CNC turning machine graphical display
- 3.d. Edit programs in the CNC turning machine control
- 3.e. Edit programs at the computer
- 3.f. Save programs in the specified format
- 3.g. Send programs to instructor

4. Utilize MDI mode to write conversational programs

Assessment Strategies

- 4.1. In the classroom, lab, or shop setting
- 4.2. Using actual CNC machine tools
- 4.3. In written and applied assignments
- 4.4. Individually
- 4.5. On tests and quizzes
- 4.6. Given prints, tutorials, materials, and all available shop equipment and supplies

Learning Objectives

- 4.a. Write conversational programs in MDI mode
- 4.b. Write a conversational program using a tutorial
- 4.c. Write a conversational program for an approved part
- 4.d. Verify programs in graphical interface

5. Utilize MDI mode to write basic G&M code programs

Assessment Strategies

- 5.1. In the classroom, lab, or shop setting
- 5.2. Using actual CNC machine tools
- 5.3. In written and applied assignments
- 5.4. Individually
- 5.5. On tests and quizzes
- 5.6. Given prints, tutorials, materials, and all available shop equipment and supplies

Learning Objectives

- 5.a. Use MDI functions
- 5.b. Write a G&M code program using a template
- 5.c. Write a simple CNC turning center program in G&M code language from an approved part print
- 5.d. Write simple G&M code programs at the machine control on EIA/ISO controlled machines
- 5.e. Verify programs in graphical interface

6. Create an outline for writing a Mazak turning center program

Assessment Strategies

- 6.1. In the classroom, lab, or shop setting
- 6.2. Using interactive computer software and/or actual CNC machine tools
- 6.3. In written and applied assignments
- 6.4. Individually
- 6.5. On tests and quizzes
- 6.6. Given prints, directions, templates, and all available shop equipment and supplies

Learning Objectives

- 6.a. Explain the purpose of Mazak programming
- 6.b. Describe the purpose of cutting conditions data
- 6.c. Describe the process for entering new material data
- 6.d. Explain the steps for entering Mazak cutting conditions and material selection data
- 6.e. Explain Mazak tool data relative to data entry
- 6.f. Describe the relationship between tool style or shape and turret position
- 6.g. Explain the steps for entering tool file and tool data on Mazak controls
- 6.h. Explain the process for entering chuck data in Mazak machine displays
- 6.i. Explain the purpose of the Mazak tool life management system

- 6.j. Describe the process of setting and resetting tool life values
- 6.k. Describe the process for entering materials shape data in Mazak controls
- 6.l. Describe the process for entering data sets to create features in Mazatrol programs
- 6.m. Detail the process of writing a new Mazak program

7. Edit programs on CNC turning machines

Assessment Strategies

- 7.1. In the classroom, lab, or shop setting
- 7.2. Using actual CNC machine tools
- 7.3. In written and applied assignments
- 7.4. Individually
- 7.5. On tests and quizzes
- 7.6. Given prints, process sheets, specification sheets, and all available shop equipment and supplies

Learning Objectives

- 7.a. Analyze conversational programs for errors requiring changes
- 7.b. Select programs in Edit mode on conversationally controlled CNC turning machines
- 7.c. Use Edit mode functions on conversational CNC turning machines
- 7.d. Edit programs on conversationally controlled CNC turning machines
- 7.e. Analyze G&M code programs for errors or required changes
- 7.f. Select programs for editing in Edit mode on CNC turning centers
- 7.g. Use edit mode functions on EIA/ISO controlled CNC turning centers
- 7.h. Edit G&M code programs on EIA/ISO controlled CNC turning centers

8. Transfer programs from external devices to CNC turning machine memory

Assessment Strategies

- 8.1. In the classroom, lab, or shop setting
- 8.2. Using computers and actual CNC machine tools
- 8.3. In written and applied assignments
- 8.4. Individually
- 8.5. On tests and quizzes
- 8.6. Given logs and all available shop equipment and supplies

Learning Objectives

- 8.a. Describe external storage devices for CNC programs
- 8.b. Describe methods used to transfer programs to CNC machines
- 8.c. Describe naming protocols for files
- 8.d. Locate files in a directory
- 8.e. Back up programs
- 8.f. Send programs from computer to machine tool
- 8.g. Transfer programs to machine memory

9. Prove out programs

Assessment Strategies

- 9.1. In the classroom, lab, or shop setting
- 9.2. Using actual CNC machine tools
- 9.3. In written and applied assignments
- 9.4. Individually
- 9.5. On tests and quizzes
- 9.6. Given prints, diagrams, inspection sheets, stock, and all available shop equipment and supplies

Learning Objectives

- 9.a. Use safety precautions when starting and running CNC turning machines
- 9.b. Complete program check list prior to proving programs
- 9.c. Follow specified procedures for proving out programs
- 9.d. Check positioning of tools and parts
- 9.e. Check programs by using graphical interface
- 9.f. Check programs by "cutting air"
- 9.g. Check programs using single block function
- 9.h. Check part quality for each operation
- 9.i. Check part quality for first run parts

9.j. Use machine overrides to control machine speed and feedrates

10. Run programs in CNC turning machines

Assessment Strategies

- 10.1. In the classroom, lab, or shop setting
- 10.2. Using actual CNC machine tools
- 10.3. In written and applied assignments
- 10.4. Individually
- 10.5. On tests and quizzes
- 10.6. Given prints, diagrams, pictures, inspection sheets, materials, and all available shop equipment and supplies

Learning Objectives

- 10.a. Use safety precautions when setting up and running CNC turning machines
- 10.b. Set up CNC turning machines to run programs
- 10.c. Select programs to run in CNC turning machines
- 10.d. Follow procedures for first part runs
- 10.e. Run programs in conversationally controlled CNC turning machines
- 10.f. Run programs in EIA/ISO controlled CNC turning machines

11. Use offsets to correct dimensional errors on turned parts

Assessment Strategies

- 11.1. In the classroom, lab, or shop setting
- 11.2. Using interactive computer software and/or actual CNC machine tools
- 11.3. In written and applied assignments
- 11.4. Individually
- 11.5. On tests and quizzes
- 11.6. Given diagrams, materials, and all available shop equipment and supplies

Learning Objectives

- 11.a. Use safe operating procedures when setting up or running CNC turning machines
- 11.b. Inspect first run parts
- 11.c. Use inspection reports to determine corrective actions
- 11.d. Compare actual part dimensions to print dimensions
- 11.e. Analyze part quality
- 11.f. Explain the effect of tool offsets on part geometry
- 11.g. Describe four considerations required before making offset adjustments
- 11.h. Explain the impact of offsets on programs using radii and those using diameters
- 11.i. Explain the effect of offset corrections on Z axis versus X axis dimensions
- 11.j. Demonstrate how to locate offset screens using various CNC turning center machine controls
- 11.k. Perform offset adjustments to establish part tolerances for first part
- 11.l. Change tooling and adjust offsets
- 11.m. Repeat program run to verify corrective actions
- 11.n. Complete inspection reports