

Western Technical College

31420312 CNC Lathe Programming-Basic

Course Outcome Summary

Course Information

Description	An introduction to planning and writing programs for computer numerically controlled turning centers using G and M code. Participants learn to write basic programs for CNC lathes, proof programs, and run programs in CNC machine tools. Learners will set up workpieces in machines, enter programs, set tool offsets, enter tool compensation, and complete part projects. Programming basics will include multiple tool programs, tool nose compensation and canned cycles.
Career Cluster	Manufacturing
Instructional Level	Technical Diploma Courses
Total Credits	1.00

Textbooks

420-310 CNC Programming Manual Machine Tool Technology. 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. **Use effective communication skills.**

4. Use technology effectively.

Course Competencies

1. Apply safety procedures to lab applications

Assessment Strategies

- 1.1. In the classroom, lab, or shop setting
- 1.2. In written and applied assignments
- 1.3. Individually and in groups
- 1.4. On tests and quizzes
- 1.5. Given materials and all available shop equipment and supplies

Learning Objectives

- 1.a. Wear safety glasses in the lab
- 1.b. Maintain clean work area
- 1.c. Adhere to machine maintenance schedule
- 1.d. Identify CNC shop safety hazards
- 1.e. Follow procedures for machine warm-up, set-up, operation, and shut down
- 1.f. Respect machine tools and equipment

2. Describe CNC turning machine systems

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

Learning Objectives

- 2.a. Describe types of CNC machine tools
- 2.b. Describe CNC turning centers
- 2.c. Describe CNC turning center systems
- 2.d. Explain the function of the machine control unit
- 2.e. Explain the function of CNC turning centers in CNC systems
- 2.f. Describe the function of computers in CNC systems
- 2.g. Describe storage medium for CNC systems
- 2.h. List methods of loading programs into a CNC turning center machine control

3. Associate the Cartesian coordinate system with CNC turning center axes

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, and all available shop equipment and supplies

Learning Objectives

- 3.a. Discuss the purpose of the Cartesian coordinate system in CNC turning center machining
- 3.b. Identify coordinate axes of CNC lathes and turning centers
- 3.c. Describe the three Z position relationships between the workpiece and tool
- 3.d. Explain the X coordinate radius and diameter relationship to the workpiece center
- 3.e. Locate coordinate points graphically for CNC turning center axes

4. Identify standard and auxiliary machine tool axes

Assessment Strategies

- 4.1. In the classroom, lab, or shop setting
- 4.2. Using computers and actual CNC machine tools

- 4.3. In written and applied assignments
- 4.4. Individually
- 4.5. On tests and quizzes
- 4.6. Given prints, diagrams, and all available shop equipment and supplies

Learning Objectives

- 4.a. Differentiate various axis coordinate systems for CNC turning centers
- 4.b. Identify standard CNC turning center axes
- 4.c. Identify auxiliary CNC turning center axes
- 4.d. Illustrate CNC turning center axis motions
- 4.e. Tabulate X and Z coordinates for turning centers
- 4.f. Differentiate incremental and absolute axes and movements on CNC turning centers
- 4.g. Orient workpieces in CNC turning center relative to part print dimensions

5. Describe terminology associated with CNC turning center programming

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, materials, and all available shop equipment and supplies

Learning Objectives

- 5.a. Identify terms related to CNC turning machines
- 5.b. Describe CNC turning program word address terms
- 5.c. Explain G and M code terms related to CNC turning center programming
- 5.d. Identify print terms related to CNC machining
- 5.e. Differentiate tooling terms as they relate to CNC turning centers

6. Classify tooling for CNC machine tools

Assessment Strategies

- 6.1. In the classroom, lab, or shop setting
- 6.2. Using actual CNC machine tools
- 6.3. In written and applied assignments
- 6.4. Individually
- 6.5. On tests and quizzes
- 6.6. Given prints, process sheets, specification sheets, and all available shop equipment and supplies

Learning Objectives

- 6.a. Identify CNC lathe tooling
- 6.b. Select appropriate tools for hole operations
- 6.c. Select appropriate tools for turning operations
- 6.d. Describe types of materials used for cutting tools
- 6.e. Calculate speeds and feeds for CNC turning applications
- 6.f. Explain the purpose of cutting fluids

7. Interpret G, M, and other programming code functions

Assessment Strategies

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

Learning Objectives

- 7.a. Interpret CNC turning center programming codes
- 7.b. Interpret CNC turning center word address codes
- 7.c. Describe program and sequence formats for CNC turning center programming
- 7.d. Determine address arrangements in blocks

- 7.e. Apply proper programming language format for CNC turning center programs
- 7.f. Select appropriate G, M, and other codes for CNC turning center program blocks
- 7.g. Describe the effect of CNC codes on CNC turning center tool movements

8. Write basic programs for CNC lathes or turning centers

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 prints, process sheets, specification sheets, and all available shop equipment and supplies

Learning Objectives

- 8.a. Write program start sequences for CNC turning centers
- 8.b. Write linear interpolation programs for CNC turning centers
- 8.c. Write circular interpolation programs for CNC turning centers
- 8.d. Write program ending sequence for CNC turning centers
- 8.e. Write absolute positioning programs for CNC turning centers
- 8.f. Incorporate incremental positioning in CNC turning center programs
- 8.g. Explain the parts of a CNC turning center program
- 8.h. Write simple programs for CNC turning centers

9. Apply mathematical concepts to write programs for CNC machine tools

Assessment Strategies

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

Learning Objectives

- 9.a. Perform addition and subtraction as they relate to CNC turning center coordinates
- 9.b. Compute triangles using trigonometry
- 9.c. Calculate machine moves using absolute values
- 9.d. Calculate machine moves using incremental values
- 9.e. Determine diametrical coordinates based on radial dimensions

10. Write multiple function programs for CNC turning centers

Assessment Strategies

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

Learning Objectives

- 10.a. Write CNC turning center programs with multiple tool changes
- 10.b. Write CNC turning center programs using tool nose radius compensation
- 10.c. Write CNC turning center programs that include canned cycles
- 10.d. Write CNC turning center programs that include G71 and G70 machine cycles

11. Prepare CNC turning center to run programs

Assessment Strategies

- 11.1. In the classroom, lab, or shop setting
- 11.2. Using actual CNC machine tools
- 11.3. In written and applied assignments
- 11.4. Individually

- 11.5. On tests and quizzes
- 11.6. Given prints, diagrams, materials, and all available shop equipment and supplies

Learning Objectives

- 11.a. Discuss CNC turning center job planning and programming sequence
- 11.b. Explain the importance of warm-up cycles for CNC turning centers
- 11.c. Demonstrate proper work set up procedures for CNC turning centers
- 11.d. Demonstrate proper tool set up procedures for CNC turning centers
- 11.e. Locate work and tool coordinate offsets
- 11.f. Set tool offsets
- 11.g. Load programs in CNC turning center machine control

12. Prove CNC turning center program validity

Assessment Strategies

- 12.1. In the lab or shop setting
- 12.2. In applied assignments
- 12.3. Using actual CNC machine tools
- 12.4. Individually
- 12.5. On tests and quizzes
- 12.6. Given prints, diagrams, materials, and all available shop equipment and supplies

Learning Objectives

- 12.a. Call up and activate programs
- 12.b. Verify programs in graphical interface
- 12.c. Correct program errors
- 12.d. Run programs to produce part
- 12.e. Inspect part accuracy