South Central College

MTT 1110  CNC Milling Level I

Course Outcome Summary

Course Information

Description  This course provides the student an introduction to basic milling operations. Upon completion of this course the student will have an understanding of manual and Computer Numerical Control (CNC) milling practices as well as gain knowledge in tooling, machining practices and applied mathematics. Teamwork, critical thinking and problem solving are emphasized. Hands-on experience and practical applications are included. (Prerequisite: Declare MTT as a major)

Total Credits  5
Total Hours  128

Types of Instruction

Instruction Type  Credits/Hours
Lec  2/32
Lab  3/96

Pre/Corequisites

Declare MTT as a major.

Institutional Core Competencies

Communication - Students will be able to demonstrate appropriate and effective interactions with others to achieve their personal, academic, and professional objectives.

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. Demonstrate Shop Safety
   - Learning Objectives
   - Explain Key Terms
   - Demonstrate Proper Mill Power-Up and Power-Down Procedures
   - Demonstrate Proper Lockout/Tagout Procedures

2. Identify CNC Milling Machine Types
Learning Objectives
Identify and Explain Vertical and Horizontal Spindle Machines
Describe the Machine Axes Used for Milling
Explain Manufacturing Cell

3. **Identify Basic Components of a CNC Milling Machine**
   
   **Learning Objectives**
   
   Analyze CNC Mill Operations Manual
   Identify Work Envelope
   Identify Control Panel

4. **Use Work Holding Solutions**
   
   **Learning Objectives**
   
   Explain Workholding Techniques
   Demonstrate Various Workholding Applications
   Demonstrate Workpiece Clamping
   Use Machine Vices
   Apply Workholding Solutions with Chucks, Collet Closers and Indexing Fixtures

5. **Use Tool Holding Solutions**
   
   **Learning Objectives**
   
   Acknowledge Cutting Tool
   Identify Spindle Types
   Demonstrate Tool Attachment to Various Tool Holders

6. **Demonstrate Milling Machine Canned Operations**
   
   **Learning Objectives**
   
   Explain Canned Cycles
   Apply Holemaking Operations
   Demonstrate Peck Drilling Cycles
   Demonstrate Single-Pass Drilling

7. **Explore Indexing and Rotary Table Operations**
   
   **Learning Objectives**
   
   Define Parts of the Rotary Table
   Perform Rotary Table Setup
   Explain Indexing Head
   Perform Indexing Head Setup

8. **Demonstrate CNC Machining Basics**
   
   **Learning Objectives**
   
   Demonstrate Face Milling
   Demonstrate Squaring a Block
   Demonstrate Slot Milling
   Perform Keyseat Milling Operation

9. **Describe the Two Major Types of Automatic Tool Chargers (ATCs)**
   
   **Learning Objectives**
   
   Define Automatic Tool Changers
   Identify Swing-Arm Type Tool Changer
   Explain Carousel-Type Tool Changer

10. **Utilize Coordinate Geometry**
    
    **Learning Objectives**
    
    Explain the X, Y and Z Axes
    Align Coordinate Positioning
    Demonstrate Workpiece X, Y and Z Offsets
    Calculate Tolerances
11. **Identify Control System**
   - Learning Objectives
   - Identify Types of CNC Control Panels
   - Demonstrate Soft Key Use
   - Analyze Control Panel Screen Function Labels
   - Explain Manual Data Input (MDI) and Auto Modes

12. **Explain Program Planning**
   - Learning Objectives
   - Explain Part Overview
   - Identify Part Material Composition
   - Define Type of Motion for Milling Part
   - Calculate Tool-Change

13. **Demonstrate Programming G and M Codes**
   - Learning Objectives
   - Explain G and M Codes
   - Define Screen Display and Keyboard
   - Demonstrate Linear Interpolation for CNC Milling
   - Demonstrate Circular Interpolation for CNC Milling
   - Demonstrate Two-Dimensional CNC Milling

14. **Explain Offsets**
   - Learning Objectives
   - Interpret Work Offsets
   - Explain Machine Origin and Workpiece Origin
   - Define Workshift
   - Calculate X, Y and Z Offset Settings

15. **Activate Homing Procedure**
   - Learning Objectives
   - Demonstrate Machine Power-Up
   - Demonstrate Homing Procedure
   - Demonstrate Jog Operation
   - Activate Zero Return Operation

16. **Describe Coordinate Systems**
   - Learning Objectives
   - Acknowledge Machine Coordinate Move Operations on Control Panel
   - Explain Work Coordinate System
   - Identify Cartesian Coordinate System

17. **Utilize Different Methods for Loading Programs**
   - Learning Objectives
   - Explain Program Entry
   - Demonstrate Manual Typing of Program into the Control Panel
   - Demonstrate Uploading Program to the Mill from a PC
   - Demonstrate Downloading Program from a PC to the Mill

**SCC Accessibility Statement**

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Additional information and forms can be found at: [www.southcentral.edu/disability](http://www.southcentral.edu/disability)

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