



South Central College

## MTT 1110 CNC Milling Level I

### Course Outcome Summary

#### Course Information

<b>Description</b>	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)
<b>Total Credits</b>	5
<b>Total Hours</b>	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**

South Central College strives to make all learning experiences as accessible as possible. If you have a disability and need accommodations for access to this class, contact the Academic Support Center to request and discuss accommodations. North Mankato: Room B-132, (507) 389-7222; Faribault: Room A-116, (507) 332-7222.

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

This material can be made available in alternative formats by contacting the Academic Support Center at 507-389-7222.