SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MET-152/MET-152L Class/Lect. Hours: 1 Lab Hours: 2 Credits: 3 Dept.: MECHINCAL (cnco.coc)

Course Title: Introduction to CNC Machining Semester: Spring Year: 2017

Course Description, Prerequisite, Corequisite:

This course is designed to prepare students for an entry level position as a CNC operator or setup technician. It covers fundamental concepts of CNC including CNC operation, setup, and basic program editing. All topics will be introduced in lecture and reinforced with practical application during lab. Students will manufacture all parts of a simple assembly using industry standard CNC machinery.
This course focuses on three axis CNC milling and two axis CNC turning. Emphais is placed on setting work and tool offsets, verifying CNC program, first article inspection, and adjusting offsets to bring part dimensions into blueprint specification. Students will learn standard G and M coding and create basic CNC programs to understand how the Cartesian Coordinate System applies to CNC mills and lathes.
Standard milling and turning tools will be discussed. Students will design processes to manufacture parts based on a given blueprint specification. They will determine stock size, tool selection, and calculate optimum cutting speeds and feeds.

Prerequisites:

- Prerequisites: MAT 078 , MAT 073 or MAT 079 (C- or better) or placement at Algebra I on the math placement test

Corequisites:

- MET-152L

Course Objective	Competencies
1. Learn power up and homing procedures for CNC mill and lathe.	• Discuss the significance of lab safety.
2. Learn to manually jog and perform tool changes on CNC mill and lathe.	• Demonstrate full control over the machine when performing manual functions. • Identify potential collisions between fixtures and tools.
3. Explain how the Cartesian Coordinate System is applied to CNC milling.	• Learn the "Left Hand Rule" and how it applies to CNC milling and turning • Program to tool motion rather than machine component movement.
4. Run "turnkeyed" (pre-prepared) programs on CNC mill and lathe.	• Understand how operation sheets are used in a modern precision manufacturing company. • Understand the role of a CNC operator, setup technician, and programmer. • Distinguish between a setup sheet, operation sheet, and finished blueprint. • Use dial calipers, micrometer, and depth micrometer to inspect part quality against a blueprint. • Interperet high and low limit values based on a nominal value and a tolerance on a blueprint. • Learn to read values in thousandths of an inch (the standard unit of precision machining). • Adjust wear offsets to bring a part into specification. • Perform manual tool changes.

Course Objective	Competencies
5. Determine optimum cutting speeds and feeds on CNC mill and lathe.	• Determine the proper cutting depth, speeds & feeds for the material being machined. • Identify different types of standard tooling, including each tool's strengths, weaknesses, and limitations.
6. Show how fixturing can affect the dimensional accuracy and geometric form of a part.	• Understand the implications of inconsistent torque on fixturing. • Use precision inspection equipment to satisfy geometric tolerances on blueprints.
7. Learn to set work and tool offsets on CNC mill and lathe.	• Set work and tool offsets on CNC mill and lathe. • Check work offsets visually using a spot drill. • Check tool length offsets using the gauge point check method. • Explain where offsets are stored. • Learn to use an edgefinder on a CNC mill. • Learn to use a tool probe on CNC lathe.
8. Learn to simulate toolpaths and check correctness of a setup before running a first piece with a new setup.	• Interpret an existing CNC program to identify which work offset it uses. • Use graphic run on the CNC controller and CNC simulation software on desktop computers to simulate machine motion prior to running the machine.
9. Highlight important codes in existing CNC programs and explain their functions.	• Interpret machine motion based on motion codes in a program: Rapid Traverse (G0), Linear Cutting (G1), Circular Cutting (G2 and G3).

Course Objective	Competencies
	• Understand when to change T, (H), (D), S, and F codes • Identify the gauge point check and the active work offset in a CNC program. • Explain canned cycles for CNC mill and lathe.
10. Learn basic concepts of continuous path programming (contouring) on CNC mill and lathe.	• Understand stock left for finish and adjust in process measurements accordingly. • Explain why cutter compensation is helpful for longhand programming and how and operator can adjust part size at the machine. • Understand rules for turning cutter compensation on and off.
11. Determine optimum machining process to satisfy blueprint requirements with minimal cycle time and operator intervention.	• Select approprtiate stock size. • Determine which features will be machined in which operation. • Select proper tooling and toolpath according to blueprint tolerances.