SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MET-151 Department: Mechanical Engineering Technology

Course Title: CNC Applications Semester: Fall Year: 2016

Course Objective	Competencies
1. Review critical information from previous CNC courses (MET 150).	1. Discuss the proper start-up procedures for both the lathe and the mill. 2. Discuss the Cartesian Coordinate System as applied to both the lathe and mill. 3. Develop CNC programs using the proper programming syntax. 4. Use Canned Cycles in a milling program. 5. Establish Tool Length Offsets for the lathe and mill. 6. Use Tool Radius Compensation on both the Lathe and Mill. 7. Demonstrate a working knowledge of all safety rules as they apply to the lab area. Demonstrate proficiency in the safety rules as they apply to the CNC machines and associated tooling.
2. Understand the use and functions of all the keys on the controller.	1. Discuss the differences in the machine function keys. 2. Describe the function of the Jog Keys. 3. Understand the function of the override keys. 4. Understand the function of the Display keys. 5. Understand the difference between handle and jog modes. 6. Identify the curser keys and their function. 7. Describe the function of MDI/DNC mode. 8. Discuss the function of single block mode. 9. Identify the function of the MEM mode and its sub-functions. 10. Describe the use of Zero Return Mode. 11. Describe the use of the List Program key and its sub-functions. 12. Identify the Numeric Keys and their sub-functions.

Course Objective	Competencies
3. Understand what affects the accuracy of CNC machines.	1. Identify the tolerances of the machine tool, the tool holders, and the cutting tools. 2. Understand the relationship between accuracy and repeatability. 3. Describe the work envelope of the both the mill and lathe. 4. Understand what can diminish the mill or lathe's accuracy. 4. Describe what can improve the overall cutting tools life. 5. Identify the effects that coolant can have on part finish, tolerance and tool life.
5. Demonstrate the use of both a tool probe for the lathe and a tool presetter for the mill.	1. Discuss what lathe options can improve the set-up time. 2. Demonstrate the use of a tool pre-setter for the mill and explain the impact on machine set-up and inventory control.
6. Write a CNC program at the machine using "Quickcode".	1. Demonstrate how to access "quickcode" from the controller. 2. Understand the function of the edit and group window. 3. Identify the function of the help window and the types of solutions available from the help window. 4. Identify the special numeric keys available using "quickcode". 5. Demonstrate the ability to invoke a drilling or tapping canned cycle.
7. Discuss the use of Macros available for the mill.	1. Understand how the use of Macros can allow a subroutine to be altered. 2. Demonstrate how patterns that repeat can be automated through the use of macros. 3. Identify the G code, which calls the macro. 4. Describe the difference between local, global, and system variables.
8. Demonstrate how to set-up and program the 4^{th} axis rotary table,	1. Demonstrate how to mount the rotary table onto the mill and indicate properly. 2. Demonstrate an understanding of the direction of the A and B axis rotation. 3. Identify potential programming hazards associated with the rotary table such as clearance issues. 4. Demonstrate proper technique when proving out the program at the machine to reduce undesirable outcomes.

Course Objective	Competencies
9. Identify different styles of tool holders for the lathe and mill and their associated inserts.	1. Discuss the advantages of carbide inserts. 2. Calculate the proper RPM for a given style insert. 3. Demonstrate a working knowledge of how to evaluate the proper federate along with depth of cut for a particular insert /holder combination from a printed resource.
10. Process projects using proper program preparation.	1. Use a set-up sheet with each change of axis plotted to assist in programming. 2. Selecting proper tooling for the job. 3. Use the correct tool geometry for the job. 4. Select the correct insert size & shape. 5. Understand how to select proper insert grade. 6. Determine the proper cutting depth, speeds & feeds for the material being machined.