SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MET-121/MET-121L Class/Lect. Hours: 2 Lab Hours: 1 Credits: 3 Dept.: MECH.AS

Course Title: Fundamentals of CMM/ Fundamentals of CMM Lab Semester: Fall Year: 2016

Course Description, Prerequisite, Corequisite:

This course is an introduction to the fundamental concepts of the Coordinate Measuring Machine (CMM). This course discusses how CMMs integrate into precision manufacturing environments and where they fit in automated production processes. Coverage includes a CMM overview, basic terminology, machine operation using existing programs, and fundamental programming concepts. Students will be instructed in best practices for probe calibration and part fixturing, focusing on accurate and repeatable measurement. Students will develop an understanding of blueprint tolerances and use that knowledge to identify nonconforming parts and their assignable causes. Throughout the course, students will be required to perform calculations to identify upper and lower tolerances based on provided blueprints. Students will develop a solid understanding of how the Cartesian Coordinate System and vectors are used to program CMMs.

Prerequisites:

- MAT 078 , MAT 073 or MAT 079 (C- or better) or placement at Algebra I on the math placement test.
- MET-120

Corequisites:

- MET-121L

OBJECTIVES/COMPETENCIES

Course Objective	Competencies
1. Understand what a CMM is and what it does	1. Explain how CMM creates digital measurements 2. Understand basic components of a CMM
2. Perform the proper start-up procedures for a CMM	1. Discuss machine maintenance 2. Explain homing procedure 3. Execute homing procedure
3. Understand machine safety and maintenance	1. Identify common causes of machine crashes 2. Develop best practices for preventing machine damage
4. Set up fixturing for repeatable measurement	1. Identify standard workholding devices 2. Understand importance of repeatability in fixturing 3. Develop best practices for locating work pieces 4. Interpret setup documentation for machine fixturing
5. Discuss the Cartesian Coordinate System as applied to CMM	1. Identify and label X, Y, Z, A, B, and C axes 2. Understand directionality and how it affects measurements 3. Develop fundamental understanding of vectors and planes 4. Identify three standard views and six standard work planes 5. Understand differences between machine coordinate systems and part coordinate systems

Course Objective	Competencies
6. Perform Manual Alignments based on existing CMM programs	1. Develop proficiency moving CMMs with a joystick 2. Understand function keys on joystick 3. Develop fundamental understanding of software interface 4. Select appropriate program and probe features in the proper order and direction to set up part coordinate system
7. Build a digital rendering of a CMM probe in software	1. Understand a probe's function 2. Identify standard probe components 3. Identify industry standard probe sizes and configurations 4. Manually assemble probes based on graphics
8. Calibrate a CMM probe	1. Understand the importance of probe calibration 2. Understand what situations call for probe recalibration 3. Develop a working knowledge of probe calibration procedures
9. Validate inspection results against a blueprint	1. Use existing programs to generate inspection reports 2. Evaluate part correctness based on blueprint tolerances 3. Deduce possible causes for nonconforming parts
10. Understand basic feature types	1. Understand minimum points for each feature 2. Understand projection planes for true feature measurement 3. Use auto- recognition to define features 4. Override the software's default feature guesses

Course Objective	Competencies
11. Write a basic CMM program using a machined part	1. Determine the ideal manual alignment for a given part 2. Program a canned manual alignment 3. Set up an automatic alignment using a pre-defined datum scheme 4. Create an inspection report using blueprint tolerances