COURSE SYLLABUS

Tunxis Community College

Education That Works For a Lifetime

Course Title:	Metrology	Date submitted:	4/30/2018 (18-25)
Department:	Advanced Manufacturing Technology		
Curriculum:	Technology Studies		

Course Descriptors: Make certain that the course descriptors are consistent with college and Board of Trustees policies, and the current course numbering system.

Course Code: (eg. ACC 101)	MFG*120
Course Type:	X

A: Clinical B: Lab D: Distance Learning I: Individual/Independent L: Lecture N: Internship M: Seminar P: Practicum U: Studio X: Combined Lecture/Lab Y: Combined Lecture/ Clinical/Lab Z: Combined Lecture/Studio

Elective Type:	G

AH: Art History E: English FA: Fine Arts FL: Foreign Language G: General HI: History HU: Humanities LAS: Liberal Arts & Sciences M: Math S: Science SS: Social Science

Credit Hours:	3
Developmental: (yes/no)	No
Contact Hours: Lecture:	2
Contact Hours: Clinical:	0
Contact Hours: Lab:	1
Contact Hours: Studio	0
Contact Hours: Other:	0
TOTAL:	3
Class Maximum:	30
Semesters Offered:	Fall, Spring

Prerequisites:

Manufacturing Math II (MFG*105)

Corequisites:

None

Other Requirements:

None

Catalog Course Description:

Metrology is applied in such areas as: manufacturing, aerospace, telecommunications, electrical power, transportation, medicine, pharmaceuticals, food production, packaging, construction, atmospheric research and environmental protection. The course provides the student with an introduction to the usage of inspection tools and automated inspection equipment and provides a comprehensive set of hands- on exercises to determine the dimensional characteristics of a variety of manufactured parts. The emphasis of this metrology course is metrology in manufacturing. The student will utilize the following tools: vernier caliper, micrometer, precision height stand, dial bore gage, snap gage, V block, dial test indicator, Sine bar, gage block set, Angle block, and CMM & CMM programming.

Topical Outline: List course content in outline format.

[The outline should be in title case and use the numbering format below. You may not have subtopics, but if you do, here is the format.]

INSTRUCTIONAL UNITS:

1. History, Principles, Variety of Tools and Measuring Systems
   - A. Different types of measurements
   - B. Accuracy
   - C. Precision
   - D. Reliability
   - E. Discrimination
   - F. Inch system of measurement
   - G. Metric system of measurement
   - H. Care and handling of measurement tools

2. Steel Rule:
   - A. Various type of rules and their functions.
   - B. Discrimination of rules and their reliability and expectation of accuracy.
   - C. Use rules on sample parts to obtain accurate measurements.

3. Vernier, Dial and Digital Instruments
   - A. The Principle of the vernier scale
   - B. The discrimination, reliability, and expectation of accuracy of the vernier caliper, dial caliper, and digital caliper
   - C. Use vernier calipers on sample parts to obtain accurate measurements
   - D. Proper handling and care of vernier calipers, dial calipers, and digital calipers

4. Micrometer Instruments
   - A. Micrometer discrimination, reliability, and expectation of accuracy
   - B. Variety and differing applications of micrometers
   - C. Use micrometers on sample parts to obtain accurate measurements
   - D. Proper handling and care of micrometers

5. Use of the Precision Height Stand
   - A. Assembling the height stand
   - B. Setting to zero with 1-2-3 block standard
   - C. Reading the indicator dial

6. Dial Bore Gage
   - A. Assembling and using the dial bore gage for comparison measure
   - B. Use of the 1-2 inch micrometer to set or measure from the dial bore gage

7. Standards of Length and Form: The Surface Plate, Right angle Block and Gage Blocks
   - A. Understanding the accuracy of standards
   - B. Proper handling and care for standards
   - C. Gage block math

8. Measure the Almost Right Angle
   - A. Concepts and use of angular relationships in metal parts
   - B. Angular measure degree-minutes-seconds vs. decimal degrees
   - C. Basic triangle trigonometry to obtain angular values
   - D. Use of the thickness gage

9. Setting a Snap Gage with Gage Blocks
   - A. Inspection with a Go No-Go gage

10. Parallelism and Perpendicularity

	A. Intro to basic Geometric Dimensioning and Tolerancing, GD&T B. Measurement of parallelism and perpendicularity on sample parts 11. Measuring an Angle with the Sine Bar A. Assembling and using the surface gage with a dial test indicator B. Review of trigonometry for use of the 5 inch sine bar 12. Measuring the Locaton of a Hole A. Quantifying a circle: diameter and location of center 13. Gage R&R with Micrometers A. Repeatability and reproducibility in measurement
Outcomes: Describe measurable skills or knowledge that students should be able to demonstrate as evidence that they have mastered the course content.	Upon successful completion of this course, the student will be able to do the following: COURSE: Abilities should start with a measurable verb that students do. You do not need any punctuation at the end. Examples of some verbs you could use follow and more can be found at http://online.bcit.ca/guidelines/step2/Outclass.htm] (Note: The examples below are cognitive abilities. See the website for others.) 1. Demonstrate an ability to apply the basic measuring tools to a variety of sample parts and produce an inspection report. 2. Demonstrate an ability to understand and use direct measuring tools and comparison measuring tools. 3. Demonstrate an ability to understand and use standards of length and form. 4. Demonstrate an ability to use comparison tools in conjunction with inspection accessories and standards to obtain measurements of features on a variety of parts. 5. Demonstrate an understanding of geometric feature control symbols on engineering drawings.
	PROGRAM: *Electronics Technology Certificate and A.S. Degree* [Any Program Abilities should be cut and pasted here as they appear in the current catalog, including numbers. Please note that MSWord may have numbered these automatically, so when you cut and paste, make sure the numbers are correct – you will need to make them "hard" numbers rather than auto numbers.] 1. Demonstrate an understanding of Shop Safety. 2. Demonstrate an understanding the theory of electrical structure, voltage, current, resistance, and electrical circuit and their measurement. 3. Demonstrate an understanding of the basic laws of arithmetic. 4. Demonstrate an understanding of several number systems and codes that are the foundation of digital theory and digital applications. 5. Make comparisons with personal computers; as well as, develop an understanding of its origin and growth since conception. 6. Demonstrate an understanding of the fundamentals of Automated Manufacturing systems.
	GENERAL EDUCATION: *(Numbering reflects General Education Outcomes as they appear in the college catalog)* [Select the General Education Abilities from the listing below.]

	No General Education outcomes.
Evaluation: List how the above outcomes will be assessed.	Assessment will be based on the following criteria: 1. Quizzes 2. Laboratory Projects
Instructional Resources: List library (e.g. books, journals, on-line resources), technological (e.g. Smartboard, software), and other resources (e.g. equipment, supplies, facilities) required and desired to teach this course.	Required: Manufacturing lab with measuring tools, comparison tools, inspection tools, and CMM equipment. Desired:
Textbook(s)	Machine tool practices 9th ed. Kibbe, Meyer, Neely and White , latest edition