MONROE COUNTY COMMUNITY COLLEGE

Course Outcome Summary

Standard Course

QSTC 105 Fundamentals of Gauging and Basic SPC

Course Information Fundamentals of Gauging and Basic SPC
Course Number QSTC 105
Division Applied Science and Engineering Technology
Contact Hours: 45
Theory: 15
Lab Hours: 30
Off Campus Clinical Hours:
Total Credits: 2
Prerequisites: Math 090 RDG 090 or qualifying scores on accepted placement tests

Course Description: This course is an introduction to basic measurement techniques and a tutorial on use and calibration of basic dimensional measuring and test equipment; e.g. inside and outside micrometers, calipers, gage blocks, dial indicators, depth micrometers, height gages, surface plates, snap gages, and some other dimensional measurement devices. Includes an overview of metrology in general with a description of its impact on society and our lives in general. Also, a basic understanding of fundamental measurement theory, and statistical process control (SPC) application and theory; this is including SPC topics such as; run charts, control charts, a focus on continuous improvement, and the design of experiments.

Course Outcomes
In order to evidence success in this course, students will be able to:

1. Demonstrate an understanding of laboratory safety practices and proper handling techniques of sensitive measuring and test equipment with emphasis on the following:
    a. Awareness of sharp knife edges on many dimensional measuring and test equipment items.
    b. Use of gloves for handling high accuracy measuring and test equipment, reference standards, and surface plates for cleanliness and to minimize temperature effects.
    c. Use of preservatives for measuring and test equipment storage, and use. Also, for surface plate flatness preservation.
    d. Awareness of the sensitivity and fragility of many measurement and test instruments to shock, rough handling, and other forms of abuse.

2. Demonstrate an ability to determine when and how to correctly use the various measuring and test equipment types with emphasis on the following:
    a. Inside, outside, depth and various other types of micrometers
    b. Dial, vernier and digital calipers

c. Gage blocks, including proper wringing techniques. Description of the different grades and tolerances of gage blocks and making determinations of which grade is best for specific tasks.
d. Dial indicators, and dial test indicators; reading these and knowledge about the various types of this instrument.
e. Digital, dial and vernier height gages
f. Use, maintenance and purpose of surface plates, including understanding of flatness theory.
g. Articulating Arm and/or CMM use in measurements
h. Other dimensional equipment types, as needed.

3. Calibrate, and adjust measuring and test equipment with emphasis on the following:
   a. Calibrate various micrometers using gage blocks
   b. Calibrate calipers using gage blocks
   c. Calibrate Dial Indicators using dial indicator calibrator, or other applicable reference standards.
   d. Calibrate an articulating arm.
   e. Describe calibration techniques, provide data and charts that illustrate each item's calibration. State why each calibration is satisfactory or unsatisfactory.
   f. Identify, adjust, limit or recommend the disposal measuring and test equipment that has failed its calibration

4. Provide detailed descriptions of standards used to calibrate specific instruments, and also their accuracy requirements and limitations with emphasis on the following:
   a. Gage blocks used as calibration standard, grades and accuracies.
   b. Dial Indicator Calibrator, types and accuracies.
   c. Standard sphere *(As used for CMM or articulating arm calibration*); grades and accuracies.

5. Indicate what the most likely limiting factors are that create uncertainties limiting the validity of calibrations of instruments, and also what might be accomplished to minimize these effects, with emphasis on the following.
   a. Temperature, humidity, dust, dirt, lighting, air currents, magnetism, radio frequency interference.
   b. Laboratory temperature controls, lab temperature and humidity stability requirements.
   c. Coefficients of temperature compensation. Required temperature stabilization times.

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6. Explain statistical process controls; especially how these work to improve the quality of an operation or manufacturing process. Provide a description of software packages that perform statistical process controls of manufacturing processes, with emphasis on the following.
    a. List 2-3 major software packages.
    b. Describe and use run charts.
    c. Describe and use Control Charts.
    d. Describe the focus on continuous improvement as this applies to SPC.
    e. Explain design of experiments as this applies to SPC.

7. Describe statistical methods that may be used during calibrations that reduce uncertainty in measurement. Explain how and why this reduces measurement uncertainty with emphasis on the following.
    a. Single sampling; its benefits and limitations.
    b. Multiple sampling techniques, such as ABBA and ABA.

8. Explain how metrology impacts industry by providing a description of the hierarchy of measurement primary standards in our world, from international primary standards to local organizations' field measurements. Name the seven fundamental measurement parameters, with emphasis on the following.
    a. Measurement traceability from the BIPM, to industry.
    b. Seven fundamental measurement parameters.
    c. Describe and provide examples of derived parameters.

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Date Updated:
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