



Course Outcome Summary

Required Program Core Course

QSTC 210 (Advanced Metrology)

Course Information

Division	ASET
Contact Hours	30
Theory	0
Lab Hours	30
Total Credits	3

Prerequisites **QSTC 150**

Course Description

This course covers advanced metrological techniques, including CMM operation, Optical and Electronic Measuring and Graphical Inspection Analysis (paper gaging). Laboratory work concentrates on CMM operation and programming and use of Articulating Arm operation using point cloud software, and laser scanning inspections of parts.

This course is a required course for students pursuing an AAS in the Metrology/Quality program..

Program Outcomes Addressed by this Course:

Upon successful completion of this course, students should be able to meet the program outcomes listed below:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
- B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.
- D. Learn aspects of maintenance of a calibration system, including proper calibration techniques for common measuring and test equipment used within a facility.



Course Outcomes

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

1. Identify/recognize/explain geometric controls, use the cartesian coordinate system to perform geometric controlled measurements by use of a CMM and/or articulating arm and associated software.

Program outcomes linked:

- A. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
- B. Learn aspects of maintenance of a calibration system, including proper calibration techniques for common measuring and test equipment used within a facility.
- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.

2. Identify/recognize techniques for coordinate measuring machine programming.

Program outcomes linked:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
- B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.
- D. Learn aspects of maintenance of a calibration system, including proper calibration techniques for common measuring and test equipment used within a facility.

3. Demonstrate an understanding of and an ability to perform graphical inspection analysis of measurements made by a CMM and/or articulating arm and its associated software.

Program outcomes linked:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
- B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.

4. Demonstrate/Practice/Explain fixturing and functional gaging during use of CMMs and/or an articulating arm.

Program outcomes linked:



- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
 - B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
 - C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.
5. Demonstrate/Practice understanding of CMM software use by designing a program to use automatic (DCC) control of the CMM to measure a specific part.

Program outcomes linked:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
 - B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
 - C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.
6. Demonstrate/Practice understanding of CMM and/or articulating arm use by making measurements using manual or DCC (automatic) control.

Program outcomes linked:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
- B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.

7. Demonstrate/practice/explain graphical inspection and analysis of circular features.

Program outcomes linked:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
- B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.



MONROE COUNTY
COMMUNITY COLLEGE

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- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.

8. Design fixturing and functional gaging for specific parts to be measured by a CMM

Program outcomes linked:

- A. Operate basic metrology equipment commonly used in a metrology facility comprised of dimensional, pressure, temperature, mass, torque, force, surface roughness, and other metrology measurement parameters.
- B. Program, set up and operate a CMM or similar, such as an articulating arm and make measurements of materials and parts.
- C. Collect quality related data; then interpret measurement output and graphic data by use of SPC tools and the performance of Cp and Cpk analysis.

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