

**Course Outline for:** VACT 2291 High Vacuum Measurement**A. Course Description**

1. Number of credits: 1
2. Lecture hours per week: 1
3. Prerequisites: VACT 2290
4. Corequisites: None
5. MnTC Goals: None

Vacuum technology is the field whereby very low-pressure environments are created, maintained, and analyzed, such as those needed in the fields of semiconductor manufacturing, glass coating and research. VACT 2291 focuses on the design, methods and application of pressure measurement equipment used in high vacuum systems.

**B. Date last reviewed/updated:** February 2023**C. Outline of Major Content Areas**

1. Overview of measurement theory as applied to vacuum and industrial instruments.
2. Theory, operation, and maintenance of pressure gauges commonly used in the high vacuum regime.
3. Theory and operation of partial pressure analysis using mass spectrometer/residual gas analysis equipment.
4. Theory and operation of leak detection equipment and methods.
5. Troubleshooting with pressure gauges, RGA's and leak detection equipment.

**D. Course Learning Outcomes**

Upon successful completion of the course, the student will be able to:

1. Explain the concepts of measurement using industrial instrumentation as it applies to vacuum technology.
2. Describe specific operational and maintenance methods using pressure gauges, residual gas analysis, and leak detection equipment.
3. Analyze the application of various pressure gauges.
4. Interpret information obtained from total and partial vacuum measurement equipment when monitoring and troubleshooting vacuum systems.

**E. Methods for Assessing Student Learning**

Assessment methods may include, but are not limited to, the following:

1. Unit quizzes
2. A summative exam
3. Assessment of operation of high vacuum equipment, in person or remote.
4. Assessments may include:
  - a. Homework assignments
  - b. Discussions
  - c. Collaborative projects
  - d. Other quizzes

**F. Special Information**

This course is the second of 3 modular 1-credit courses VACT 2290 (High Vacuum Equipment), VACT 2291, and VACT 2292 (High Vacuum Applications) that together are equivalent to VACT 2293 Vacuum Analysis and Troubleshooting.

Course instruction includes access to a high vacuum equipment trainer system to support measurement and data collection exercises.