

Course Outline for: VACT 1293 Concepts of Rough Vacuum Systems**A. Course Description**

1. Number of credits: 1
2. Lecture hours per week: 1
3. Prerequisites: VACT 1010 or CHEM 1061
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. This course will introduce concepts of gas behaviors and pressure measurement that apply to rough vacuum systems.

B. Date last reviewed/updated: November 2022**C. Outline of Major Content Areas**

1. Applications of Vacuum Systems
2. Working with Vacuum System Measurements
 - a. Measuring instruments
 - b. Significant digits
 - c. Types of pressure readings
 - d. Converting units
3. Behavior of Gases
 - a. Ideal Gas Laws
 - b. Mean free path
 - c. Vapor pressure
 - d. Gas flow in a vacuum system
4. Introduction to rough vacuum systems
 - a. Use of chambers, pumps, gauges and valves
 - b. Schematic diagrams
 - c. Pump down and venting
 - d. Sources of gas load in a chamber

D. Course Learning Outcomes

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

1. Identify uses of vacuum systems in manufacturing.
2. Identify the parts of a vacuum system.
3. Demonstrate correct sequence of operations to pump down and vent a rough vacuum system.
4. Take physical measurements and convert them to different units.
5. Interpret how changes in pressure, temperature and volume are caused and related.

6. Define the following terms as they apply to rough vacuum: mean free path, vapor pressure, gas load.

E. Methods for Assessing Student Learning

Assessments may include, but are not limited to, the following:

1. Unit quizzes
2. A summative exam
3. Assessment of operation of rough 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 first of a 3-part series that together constitute an Introduction to Rough Vacuum Technology. It may be taught as a 5-week course so that all 3 parts may be completed in one semester.

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