Course Outline for: VACT 1294 Rough Vacuum Equipment

A. Course Description

1. Number of credits: 1
2. Lecture hours per week: 1
3. Prerequisites: VACT 1293
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 1294 covers the pump-down performance of rough vacuum systems based on the process of positive displacement. System conductance and pump-down performance are affected by the selection of the specific vacuum hardware component types, such as pumps, pressure gauges, valves, and chambers.

B. Date last reviewed/updated: December 2022

C. Outline of Major Content Areas

1. Characteristics of viscous and molecular flow regimes
2. Positive displacement process
3. Plotting the pump-down curve
4. Rough vacuum pumps
   a. Comparison of pump types
   b. Pumping speed curve
5. Pressure gauges
   a. Direct vs. indirect gauges
   b. Comparison of gauge types
   c. Accuracy and precision
6. Other system hardware
   a. Flanges
   b. Valves
   c. Tubing choices
   d. Feedthroughs
   e. Chambers
7. Conductance and throughput in a vacuum system
   a. Determining conductance of passive components
   b. Determining the effect of system conductance on effective pumping speed
   c. Relating conductance to throughput
8. Interpreting pump-down curves

9. Estimating pump-down time

D. Course Learning Outcomes

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

1. Identify flow regime in a given vacuum system.
2. Determine theoretical pumping speed, conductance and pump-down time for a vacuum system.
3. Choose appropriate vacuum pumps, pressure gauges, valves, chambers, and tubing for vacuum system requirements.
4. Interpret pump-down data graphically.

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 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 second 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.