

# ENGR 61B: VACUUM SYSTEMS

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2024
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	CHEM 1A.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

## Student Learning Outcomes

- Upon completion of the course, students will be able to describe different pressure measurement methods and when each should be used.
- Upon completion of the course, students will be able to describe the pumping process for desired level of vacuum.

## Description

This course explores the theory behind vacuum systems. Students gain an understanding of vacuum system basics and exposure to different vacuum pumps and their capabilities.

## Course Objectives

The student will be able to:

1. Demonstrate an understanding of gas laws and molecular motion
2. Calculate flow rate and describe how it is measured
3. Identify appropriate pressure measurement methods
4. Interpret mass spectrometer outputs to identify issues
5. Calculate vapor pressure
6. Describe the basic pumping process and tools
7. Apply appropriate pumps for desired level of vacuum
8. Understand how to identify leaks and methods of leak detection

## Course Content

1. Gas laws
  - a. Molecular motion
  - b. Factors that influence molecular motion
2. Gas flow rate
  - a. Flow rate concepts
  - b. Tools for measuring flow rate
3. Pressure
  - a. Pressure measurement tools
  - b. Advantages and disadvantages of different measurement tools
4. Mass spectrometer
  - a. Types of spectrometers
  - b. Troubleshooting

5. Vapor pressure
6. Pumping down process
7. Different levels of vacuum
  - a. Rough vacuum pumps
  - b. High vacuum pumps
  - c. Diffusion pumps
  - d. Molecular pumps
  - e. Cryopumps
  - f. Ion pumps
  - g. Troubleshooting
8. Leaks and leak detection

## Lab Content

Not applicable.

## Special Facilities and/or Equipment

When taught via Foothill Global Access, on-going access to computer with email software and hardware and video conferencing capabilities; email address.

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Written exams  
Student projects  
Oral presentations  
Group assignments  
Worksheets

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture  
Discussion  
Demonstration  
Active student learning is encouraged in the asking of questions, small and large-group discussion, and reflection

## Representative Text(s) and Other Materials

Borichevsky. Understanding Modern Vacuum Technology. 2nd ed.. 2017.

This is the current edition of this text. We will adopt the newest edition when it becomes available.

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

Reading assignments: Weekly reading assignments from text, handouts, web resources, lab notes, and outside sources. Approximately 30 pages of reading each week.

## **Discipline(s)**

Engineering