

Course Description**ETS2168C | Semiconductor Plasma Techniques | 4.00 credits**

This course introduces students to the principles and applications of plasma in semiconductor manufacturing, with a focus on etching and deposition processes. Students will explore wet and dry etching methods, including reactive ion etching (RIE) and inductively coupled plasma (ICP), while gaining hands-on experience in plasma characterization, process optimization, and plasma-enhanced chemical vapor deposition (PECVD). Prerequisites: ETS2160C - Intro to Semiconductors and Vacuum Science and ETS2163C Cleanroom Safety and Introduction to Cleanroom Processing

Course Competencies

Competency 1: The student will be able to define a plasma and the usage of plasma in semiconductor manufacturing by:

1. Being able to define the nature of plasma and what separates plasma from the traditional states of matter
2. Understanding key applications of plasmas in semiconductor manufacturing such as plasma-based etching and plasma-based deposition

Competency 2: The student will be able to define key etching methods in wafer manufacturing and processing by:

1. Defining the process of wet chemical etching and its strengths, weaknesses, and applications
2. Defining the process of dry plasma-based etching and its strengths, weaknesses, and applications

Competency 3: The student will be able to identify different types of plasma-based etching by:

Performing SEM imaging and parameter optimization

1. Understanding basic plasma-based etching
2. Extending the concept of traditional plasma-based etching to learning about conventional reactive ion etching (RIE)
3. Defining inductively coupled plasma (ICP) etching and its strengths relative to reactive ion etching (RIE)

Competency 4: The student will be able to characterize etch processes in a hands-on fashion by:

1. Demonstrating a visual check of plasma through a chamber viewport to identify plasma formation
2. Being able to demonstrate an understanding of theory and equipment for endpoint detection in dry etching
3. Calculating material etch rates for process optimization and process development

Competency 5: The student will be able to identify applications of plasma for deposition by:

1. Learning the fundamentals of plasma enhanced chemical vapor deposition (PECVD)
2. Understanding the key working parameters of PECVD and their influence on film properties such as temperature, power, and gas chemistry

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information