Miami Dade College

Course Description

ETS2163C | Cleanroom Safety and Introduction to Cleanroom Processing | 3.00 credits

Students learn cleanroom protocols focused on safety and contamination control. Semiconductor manufacturing processes are introduced, including photolithography, etching, deposition, and doping. Students explore characterization techniques such as microscopy and ellipsometry through hands-on cleanroom experience, emphasizing process optimization and compliance with industry standards. Recommended: Students are recommended to have completed CHM1025.

Course Competencies

Competency 1: The student will acquire working knowledge of key clean room policies and safety protocols by:

1. Having a fundamental understanding for the overall process flow of fabricating a microelectronic device
2. Understanding the different types of applications of semiconductor products including devices such as transistors, MOSFETS, diodes, and solar cells
3. Developing a working knowledge for transistor functionality and the importance of Moore's law in miniaturization

Competency 2: The student will exercise safety protocols in the semiconductor industry by:

1. Understanding and identifying different types of laboratory hazards such as toxic, corrosive, flammable, explosive, and pyrophoric materials
2. Using Safety Data Sheet (SDS) or other references to ensure the safe handling of materials
3. Demonstrating the proper use of facility safety equipment such as eye wash stations, fire extinguishers, and safety showers
4. Describing chemical compatibility and chemical waste disposal best practices
5. Interpreting the National Fire Protection Association (NFPA) diamond for lab materials and the globally harmonized system (GHS) of labelling chemicals used in the cleanroom
6. Following emergency procedures effectively

Competency 3: The student will acquire a foundation of key semiconductor manufacturing processes used in wafer fabrication by:

1. Exploring the microscale pattern transfer process of photolithography, including its principles and applications
2. Understanding material removal techniques through wet and dry etching mechanisms, emphasizing their roles in precision fabrication
3. Understanding material addition processes via physical vapor deposition (PVD) methods, such as sputtering and evaporation
4. Familiarizing with material addition through chemical vapor deposition (CVD) methods to produce high-performance and high-quality thin films
5. Understanding material growth processes through thermal oxidation
6. Developing foundational knowledge of material modification techniques, including doping and ion implantation

Competency 4: The student will develop a foundational understanding of essential characterization processes used in the production of micro and nanoscale devices by:

1. Defining characterization and explaining its importance as it relates to device fabrication and process optimization
2. Understanding the concept of scale and emphasizing the need for advanced characterization in device manufacturing
3. Gaining an introductory understanding for basic cleanroom characterization equipment such as optical microscopy, stylus profilometry, and ellipsometry

4. Engaging in practical cleanroom laboratory experience with fundamental characterization equipment

Learning Outcomes:

- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Describe how natural systems function and recognize the impact of humans on the environment