NANOTECHNOLOGY, CERTIFICATE

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Certificate Learning Objectives

- **Characterization:** Students will examine characterization techniques and measurements essential for testing and for controlling material fabrication and final device performance.
- **Material Modification:** Students will learn in detail processing techniques and about the operation of specialty tools used in materials modification in forming nanoscale devices and systems. Students will also learn to avoid unintentional material modifications. Application fields of nanotechnology in health sciences, energy, manufacturing, food, agriculture, medicine and environmental discussions will be highlighted.
- **Materials and Safety:** Students will learn the principles and practices of safe equipment operation/maintenance and materials handling in regards to environment, health and safety issues. Material classification methods based on their physical, mechanical and optical properties will be covered while vacuum systems are introduced.
- **Nanostructure:** Students will develop a detailed understanding of how materials are fabricated into nano-structures used in nanotechnology. Nanoparticles, quantum dots will be covered with their bio applications. Oxidation and plasma techniques will also be studied.
- **Nanotechnology Processes:** Students will be introduced to the basic processes involved in "top down", "bottom up", and hybrid nanofabrication including deposition, etching, and pattern transfer. Students will learn the similarities and differences in the equipment used and process flows. Nano-characterization methods will also be outlined.
- **Patterning:** Students will be able to identify techniques of advanced pattern transfer and select the appropriate tool and technique that will best create the product needed in the competitive modern workplace.