Electrical and Computer Engineering
Spring 2019

ECE 730 Topic 10
ADVACNCED TECHNOLOGIES FOR SEMICONDUCTOR PROCESSING

Term:	Spring 2019
Instructor:	Prof. Siva Sivoththaman
Lecture hours:	[redacted]
Room:	[redacted]

COURSE DESCRIPTON:

This course is intended to provide the students with the fundamentals, technological approaches, and practices in the fabrication of micro- and nano- electronic devices. Modern process technologies and design aspects for advanced devices will be covered along with the underlying theoretical concepts. Current device applications and future directions will also be discussed.

COURSE OUTLINE:

Vacuum and Plasma Processes
Introduction to vacuum, introduction to plasmas, collision processes in plasmas, electrical characteristics of plasmas, dc glow discharges, RF discharges.

Thin Films and Deposition Processes
Physical and chemical vapor deposition; Atomic layer deposition; Plasma processes; Molecular beam and liquid phase epitaxy.

Plasma Etching Processes
Role of etching in device fabrication; Modes of plasma etching; Etch chemistries; Reactive ion etching; Profile control in specific device structures.

Fabrication of Nanostructures
Top-down and bottom-up approaches; Zero-, one-, and two- dimensional structures; Nanoparticles and quantum dots; Nanotubes.

Limits of Optical Lithography
Optical lithography and its limits; Exposure techniques; Sub-micron processing.

Nano-patterning
Electron beam lithography; Nano-imprint lithography; Scanning probe techniques; Atomic scale manipulation.

Transistor fabrication and CMOS
Processes for Junctions and Gate; Basics of MOS transistor fabrication; CMOS Process sequence; Layout design; Material implications.

Fabrication of Thin film devices
Processes for thin film transistors; Circuit implementation; Display backplanes; Solar cells and photodetectors.

Nanoelectronic device fabrication
Trends in future nanoelectronic devices and fabrication options; Quantum effect, tunneling, and single-electron devices

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MARKING SCHEME:

Project/assignments: 40%, Final exam: 60%

OTHER ACTIVITY:

As part of the course, the students will take part in guided visits to nano- and micro- fabrication facilities on campus.

TEXT BOOK:

Course Notes