

ECE 6532 (Approved): Nanofabrication and Nanoscale Devices

Course Description

Fundamentals of nanostructures and devices; engineering and physics of new devices, confined structures in low dimensions and their effects on traditional devices; nanofabrication and nanomanufacturing.

Prior Course Number: 632, 835.03

Transcript Abbreviation: Nanofab Nano Dev

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Even Years

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Prereq: 6531, 5531, or 730, or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

Exclusions: Not open to students with credit for 5532 (835.03).

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Be able to appreciate and understand from a conceptual point of view semiconductor-based nanostructures, devices and systems
Learn the fundamentals of nano-fabrication and manufacturing technologies
Be exposed to the instrumentation and equipment for nanoscale device processing and characterization

Develop basic understanding of integration of nanoscale devices and systems, and nanobiotechnologies

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Nanoscale devices and nanobiotechnology	2.0							
Fundamentals of reduced dimensional structures	4.0							
Advanced nanoscale MOSFETs (FinFETs and double-gate MOSFETs)	3.0							
Single electron transistors	3.0							
Carbon-based nanomaterials and devices and nanowire FETs	4.0							
Quantum-dot optoelectronic devices	2.0							
Biosensors	2.0							
Nano-Electro-Mechanical-Systems (NEMS)	3.0							
X-ray lithography and LIGA	2.0							
Bulk and surface micromachining techniques for the fabrication of master molds	1.0							
Scanning probe microscopy	1.0							
Nanoimprinting and dip-pen lithography	2.0							
Near-field optical techniques for nanoscale fabrication and characterization	2.0							
Self-assembly and self-organization	5.0							
Polymer processing for biomedical device applications	2.0							
Integration of nanoscale biomedical devices and systems	2.0							

Representative Assignments

Homework
Research article reading

Grades

Aspect	Percent
Homework	15%
Midterm review paper (nanodevices)	35%
Final review paper (nanotechnology)	35%
In-class presentation	15%

Representative Textbooks and Other Course Materials

Title	Author
<i>Introduction to Nanoscale Science and Engineering</i>	M. Di Ventra, S. Evoy, J.R. Heflin Jr.

ABET-EAC Criterion 3 Outcomes

Course Contribution	College Outcome
***	a An ability to apply knowledge of mathematics, science, and engineering.

Course Contribution		College Outcome
***	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
*	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

Updated prereqs, exclusions, goals and topics to match university format.

Removed 632 from exclusions 1/11/13

Renumbered from 5532 11/21/13

Changed semester of offering to spring even. 3/23/15. CED

Add 5531 to prereqs since 5531 has run in the past (it's now 6531) 3/5/14 BLA

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