

ECE 5033 (Approved): Surfaces and Interfaces of Electronic Materials

Course Description

Provides the fundamental and practical basis for designing, processing, and characterizing the interfaces controlling the next generations of microelectronic and optoelectronic device structures.

Prior Course Number: 736

Transcript Abbreviation: Electron Interface

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Junior, Senior, Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Odd 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: 3030 (331), and Physics 1250 (132) or 1250H; or Grad standing in Engineering, Biological Science, or Math and Physical Sciences.

Exclusions: Not open to students with credit for 736.

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

Acquire a physical understanding of the fundamental electronic properties of semiconductor surfaces and interfaces
Learn to communicate in essay form the role of surfaces and interfaces in electrical engineering
Provide students with necessary background to understand the principle of new devices as new technologies develop

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Overview, motivation, and historical background	2.0							
Electrical measurements of semiconductor-metal contacts	1.0							
Interface states	2.0							
Ultrahigh vacuum technology	1.0							
Surface analysis: Electron, photon and ion spectroscopy overview	1.0							
Photoemission spectroscopy	3.0							
Particle-solid scattering: electrons, Auger electron spectroscopy, & electron energy loss spectroscopy	3.0							
Particle-solid scattering: ions, Rutherford backscattering spectrometry & secondary ion mass spectrometry	2.0							
Electron diffraction	1.0							
Scanned probe microscopy and spectroscopy	1.0							
Optical spectroscopies: modulation, ellipsometry, Raman, surface photovoltage, cathodoluminescence	4.0							
Electronic materials surfaces: growth, diffusion, etching, bonding, epitaxy	3.0							
Adsorbates on semiconductors	4.0							
Metals on semiconductors	5.0							
Semiconductor heterojunctions	5.0							
Future electronic interfaces & new directions	2.0							

Representative Assignments

Midterm Essay
Final Term Paper
Extra credit homework problems (optional)

Grades

Aspect	Percent
Midterm essay	40%
Final term paper	60%
Extra credit homework problems	0%

Representative Textbooks and Other Course Materials

Title	Author
<i>The Essential Guide to Electronic Surfaces and Interfaces</i> (Wiley)	Leonard J. Brillson

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

Update course description to match university version. Replacede Physics 1132 prereqi with 1250 or 1250H. Put exclusions in university form.

Next text. 8/3/16 BLA

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