Semiconductor Engineering, MS

Admissions to this program begin Fall 2025.

The Master of Science in Semiconductor Engineering, offered by the Institute for NanoSystems Innovation—along with the Department of Electrical and Computer Engineering, the Department of Mechanical and Industrial Engineering, and the Department of Chemical Engineering in the College of Engineering—and the D'Amore-McKim School of Business, is designed to meet the burgeoning demand for skilled professionals in the semiconductor industry. This cutting-edge program aims to equip students with the knowledge and skills necessary to excel in this rapidly evolving field.

The national landscape is witnessing a significant uptick in interest in expanding the talent pool within the semiconductor sector, particularly following the enactment of the U.S. CHIPS and Science Act of 2022. This pivotal legislation has catalyzed a marked increase in the demand for engineers, drawing considerable attention from a wide array of companies to the semiconductor industry. There is a need for skilled workers to build new plants to increase and localize manufacturing capacity, design chips, and the tools that make the chips. This program is strategically positioned to address this growing need, offering a comprehensive educational experience that prepares our graduates to lead and innovate in this critical domain.

Program Requirements

- Concentrations and course offerings may vary by campus and/or by program modality. Please consult with your advisor or admissions coach for the course availability each term at your campus or within your program modality.
- Certain options within the program may be *required* at certain campuses or for certain program modalities. Please consult with your advisor or admissions coach for requirements at your campus or for your program modality.

Complete all courses and requirements listed below unless otherwise indicated.

Core Requirements

Code	Title	Hours
NanoSystems		
Complete one of the following:		4
EECE 7201	Solid State Devices	
EECE 7240 and EECE 7248	Analog Integrated Circuit Design and Lab for EECE 7240	
EECE 7244	Introduction to Microelectromechanical Systems (MEMS)	
or ME 6260	Introduction to Microelectromechanical Systems (MEMS)	
Manufacturing		
Complete one of the following:		4
EECE 5606	Micro- and Nanofabrication	
MATL 7365	Properties and Processing of Electronic Materials	
ME 5630	Nano- and Microscale Manufacturing	
Innovation		
Complete four semester hours from the following. Students may not meet this requirement solely with directed study coursework:		4
BUSN 6379	Entrepreneurial Ecosystems	
BUSN 6389	Leading Global Virtual Innovation Teams	
CHME 5976	Directed Study	
GE 5010	Customer-Driven Technical Innovation for Engineers	
GE 5100	Product Development for Engineers	
INNO 6200	Enterprise Growth and Innovation	
ME 5976	Directed Study	

Concentrations

Complete one of the following concentrations:

- Devices and NanoSystems (p. 2)
- Materials and Manufacturing (p. 2)

Program Credit/GPA Requirements

32 total semester hours required
Minimum 3.000 GPA required

DEVICES AND NANOSYSTEMS

Code	Title	Hours
Complete two of the following not used to complete other requirements of this program:		8
EECE 5606	Micro- and Nanofabrication	
EECE 5651	Introduction to Photonic Devices	
EECE 7201	Solid State Devices	
EECE 7240 and EECE 7248	Analog Integrated Circuit Design and Lab for EECE 7240	
EECE 7244 or ME 6260	Introduction to Microelectromechanical Systems (MEMS) Introduction to Microelectromechanical Systems (MEMS)	
EECE 7250	Power Management Integrated Circuits	
EECE 7353	VLSI Design	
Complete one of the following options for 12 semester hours:		12
Coursework Option		
Complete 12 semester hours from the restricted electives course list. (p. 3)		
Project Option		
EECE 7945	Master's Project	
Complete 8 semester hours from the restricted electives course list. (p. 3)		
Thesis Option		
EECE 7945	Master's Project	
EECE 7990	Thesis	
Complete 4 semester hours from the restricted electives course list. (p. 3)		

MATERIALS AND MANUFACTURING CONCENTRATION

Code	Title	Hours
Complete two of the following not used to complete other requirements of this program:		8
CHME 5105	Materials Characterization Techniques	
IE 6200	Engineering Probability and Statistics	
IE 7270	Intelligent Manufacturing	
MATL 7365	Properties and Processing of Electronic Materials	
ME 5245	Mechatronic Systems	
ME 5620	Fundamentals of Advanced Materials	
ME 5630	Nano- and Microscale Manufacturing	
Complete one of the following options for 12 semester hours:		12
Coursework Option		
Complete 12 semester hours from the restricted electives course list. (p. 3)		
Project Option		
ME 7945 or CHME 7945 or IE 7945	Master's Project Master's Project Master's Project	
Complete 8 semester hours from the restricted electives course list. (p. 3)		
Thesis Option		
ME 7945 or CHME 7945 or IE 7945	Master's Project Master's Project Master's Project	
ME 7990 or CHME 7990 or IE 7990	Thesis Thesis Thesis	
Complete 4 semester hours from the restricted electives course list. (p. 3)		

Restricted Electives Course List

Any course in the following elective lists will fulfill the restricted elective requirement, provided the course has not already been applied to fulfill core requirements of this program and provided the student satisfies prerequisites. Students can take electives outside of these lists with prior approval from the faculty advisor.

Code	Title	Hours
Elective Courses in Engineering and Science		
CHME 5105	Materials Characterization Techniques	
CHME 5510	Fundamentals in Process Safety Engineering	
CHME 5621	Electrochemical Engineering	
CHME 5642 and CHME 5643	Photochemistry Fundamentals and Applications and Photochemistry Lab	
CHME 5683	Introduction to Polymer Science	
CHME 5699	Special Topics in Chemical Engineering (BioMEM Systems)	
CHME 5699	Special Topics in Chemical Engineering (Carbon Capture Storage and Utilization)	
CHME 7340	Chemical Engineering Kinetics	
EECE 5606	Micro- and Nanofabrication	
EECE 5608	Magnetic Materials for Next-Generation Electronics	
EECE 5612	Statistical Inference: An Introduction for Engineers and Data Analysts	
EECE 5644	Introduction to Machine Learning and Pattern Recognition	
EECE 5647	Nanophotonics	
EECE 5649	Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology	
EECE 5651	Introduction to Photonic Devices	
EECE 5652	Microwave Circuits and Systems	
EECE 5698	Special Topics in Electrical and Computer Engineering (Biomedical Microsystems)	
EECE 5698	Special Topics in Electrical and Computer Engineering (Introduction to Quantum Engineering)	
EECE 7201	Solid State Devices	
EECE 7240 and EECE 7248	Analog Integrated Circuit Design and Lab for EECE 7240	
EECE 7242	Integrated Circuits for Mixed Signals and Data Communication	
EECE 7244 or ME 6260	Introduction to Microelectromechanical Systems (MEMS) Introduction to Microelectromechanical Systems (MEMS)	
EECE 7245	Microwave Circuit Design for Wireless Communication	
EECE 7247	Radio Frequency Integrated Circuit Design	
EECE 7250	Power Management Integrated Circuits	
EECE 7296	Electronic Materials	
EECE 7353	VLSI Design	
EECE 7368	High-Level Design of Hardware-Software Systems	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advanced Radio Frequency Passive Tech)	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Low Power Integrated Circuits Design)	
IE 5617	Lean Concepts and Applications	
IE 5137	Computational Modeling in Industrial Engineering	
IE 6200	Engineering Probability and Statistics	
IE 6300	Manufacturing Methods and Processes	
IE 6700	Data Management for Analytics	
IE 7200	Supply Chain Engineering	
IE 7270	Intelligent Manufacturing	
IE 7280	Statistical Methods in Engineering	
IE 7285	Statistical Quality Control	
IE 7290	Reliability Analysis and Risk Assessment	
MATL 6250	Soft Matter	

MATL 6290	Fundamentals of Nanostructured Materials
MATL 7365	Properties and Processing of Electronic Materials
ME 5240	Computer Aided Design and Manufacturing
ME 5245	Mechatronic Systems
ME 5250	Robot Mechanics and Control
ME 5520	Fundamentals and Applications of Optics and Photonics
ME 5600	Materials Processing and Process Selection
ME 5620	Fundamentals of Advanced Materials
ME 5630	Nano- and Microscale Manufacturing
ME 5640	Additive Manufacturing
ME 5645	Environmental Issues in Manufacturing and Product Use
PHYS 5114	Physics and Applications of Quantum Materials
PHYS 5125	Advanced Quantum Mechanics
PHYS 5260	Introduction to Nanoscience and Nanotechnology
PHYS 5318	Principles of Experimental Physics
PHYS 5352	Quantum Computation and Information

Elective Courses in Innovation

A maximum of 4 semester hours may be taken from the following:

FINA 6309	Foundations of Accounting and Finance
GE 5010	Customer-Driven Technical Innovation for Engineers
GE 5020	Engineering Product Design Methodology
GE 5030	Iterative Product Prototyping for Engineers
GE 5100	Product Development for Engineers
HRMG 6200	Managing People and Organizations
HRMG 6230	Leading a Diverse and Inclusive Organization
HRMG 6280	The Human Side of Innovation
INNO 6200	Enterprise Growth and Innovation
MGMT 6213	Managing Ethics in the Workplace and Marketplace
MGMT 6225	Sustainability and Leadership
MGMT 6226	Sustainability and the Business Environment
MKTG 6200	Creating and Sustaining Customer Markets

FINA, HRMG, INNO, MGMT, and MKTG courses listed above are 3 semester hours, so students may take one additional 1 semester hour of courses from the list below for a total of 4 semester hours:

BUSN 6379	Entrepreneurial Ecosystems
BUSN 6389	Leading Global Virtual Innovation Teams
CHME 5976	Directed Study
ME 5976	Directed Study