

TO: The Engineering Faculty
FROM: The Interdisciplinary Engineering Team
RE: New Graduate Certificate from the College of Engineering

The Faculty of the Interdisciplinary Engineering team has approved the following new Graduate Certificate from the College of Engineering. This action is now submitted to the Engineering Faculty with a recommendation for approval.

TITLE: Graduate Certificate in Microelectronics and Semiconductors

DESCRIPTION:

The 9-credit Graduate Certificate in Microelectronics and Semiconductors offers a flexible, distance-based entry point for professional engineers and/or technology professionals to obtain critical skills and expertise in semiconductor materials, advanced semiconductor device design and modeling, integrated circuit and system design, and advanced packaging and heterogeneous integration. The Certificate has these three focus areas; students can take courses from multiple focus areas to meet the concentration requirements:

- Circuit Design (CD)
- Devices and Manufacturing (DM)
- System Design (SD)

Courses in other disciplines/areas outside of ECE will be added as they become available online.

RATIONALE:

The demand for semiconductor and circuit design engineers is projected to increase as global demand for semiconductor chips rises. Semiconductors are essential to the computer and electronic industry, and investments in semiconductors are increasing due to emerging technologies like artificial Intelligence (AI) and smart hubs. According to the Semiconductor Industry Association, the semiconductor field will add 70,000 new direct jobs by 2026. Graduate-level expertise is also valuable within the semiconductor industry. Thirty-six percent of semiconductor workers have graduate degrees, compared to an average of 14% for all other occupations. In addition to the existing master's degree and concentration available through Electrical and Computer Engineering, the Graduate Certificate will round out a suite of offerings to provide multiple entry points for current and hopeful semiconductor professionals to increase engineering expertise at Purdue. The Certificate will offer a standalone, flexible, and efficient path to obtain a formal graduate credential.



Tamara Kinzer-Ursem
Associate Dean of Graduate and Professional Education,
Marta E. Gross Associate Professor of Biomedical Engineering

Purdue University Online Interdisciplinary Engineering, Graduate Certificate in Microelectronics and Semiconductors

What is the focus of the certificate?

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What might the demand be from students?

We anticipate enrollment of 5-10 new starts per semester with a steady enrollment of 15 students at a time.

Proposing University Unit

Purdue College of Engineering is proposing this new certificate.

Required Courses

The certificate requires 9 credit hours. 3 credit hours come from one 3-credit core course or a sequence of 3, 1-credit courses. The remaining 6 credit hours will be selected from a full list of approved courses.

Note: courses in other disciplines/areas outside of ECE will be added as they become available online.

Core courses (3 credits required):

Select 1:

- ECE 55900 - MOS VLSI Design (3 credits)
- ECE 60600 - Solid State Devices I (3 credits)

Or all of the following (select 3):

- ECE 59500 - Semiconductor Fundamentals (1 credit)
- ECE 50631- Fundamentals of Current Flow (1 credit)
- ECE 59500 - Fundamentals of Transistors (1 credit)

Additional courses (6 credits required):

Course	Credits	Focus area ¹	Currently Available Online*
ECE 50616 - Physics and Manufacturing of Solar Cells	3	DM	
ECE 50632 - Intro To Quantum Transport	1	DM	X
ECE 50633 - Boltzman Law Phys Mach Learn	1	DM	X
ECE 51216 - Digital Sys Design Automation	3	SD	X
ECE 51220 - Applied Algorithms	3	SD	
ECE 52600 - Fund MEMS&Micr Int Sys	3	DM	X
ECE 55200 - Introduction To Lasers	3		X
ECE 55700 - Integrated Circuit/MEMS Fabrication Laboratory	3	DM	
ECE 56500 - Computer Architecture	3	SD	
ECE 56500 Computer Architecture	3	SD	X
ECE 56800 - Embedded Systems	3	SD	X
ECE 59500 - CMOS Analog IC Design	3	CD	X
ECE 59500 - Essentials of Transistors	1	CD	X
ECE 59500 Advanced Lithography	1	DM	
ECE 59500 Applied Quantum Computing I	1	DM/CD	X
ECE 59500 Applied Quantum Computing II	1	DM/CD	X
ECE 59500 Applied Quantum Computing III	1	DM/CD	X
ECE 59500 Data Anlys-Des Of Exp-Mach Lrn	1	DM, CD, SD	X
ECE 59500 Intro To Ele Pkg & Hetero Intg	3	DM, CD, SD	X
ECE 59500 MEMS I	1	DM, CD	
ECE 59500 MEMS II	1	DM, CD	
ECE 59500 MEMS III	1	DM, CD	
ECE 59500 Microfabrication Fundamentals	1	DM	
ECE 59500 Semiconductor Manufacturing	3	DM	
ECE 59500 VLSI Testing	1	CD, SD	X
ECE 60420 - Radio Frequency Integrated Circuits	3	CD	X
ECE 60422 - Primer on RF Design	1	CD	X
ECE 60423 - RF System Design	1	CD	X
ECE 60424 - RF Design, Passive and Active Components	1	CD	X
ECE 60424 RF Design Pass Active Compnts	1	CD	X

Focus Areas:

¹ CD (Circuit Design); DM (Devices and Manufacturing); SD (System Design)

ECE 60614 - Reliability Physics of Nanoelectronic Transistors	3	DM	
ECE 60645 High-Speed Semiconductr Devices	3	DM	
ECE 61200 - Advanced VLSI Devices (Nanoscale Transistors)	3	DM	X
ECE 65400 Solid State Devices II	3	DM, CD	
ECE 65600 Elec Transpt Semicond	3	DM	
ECE 65800 Sc Matl Device Charac	3	DM	
ECE 68800 - VLSI Testing and Verification	3	CD	
ECE 68800 VLSI Test & Verificatn	3	CD, SD	X
ECE 69500 - Advanced VLSI Design	3	CD, SD	X
ECE 69500 - High-Speed Mixed-Signal IC Design	3	CD	
ECE 69500 - System-on-chip Design	3	SD	X
ECE 69500 Advanced IoT Design & Appl	3	SD	X
ECE 69500 Flexible and Stretchable Electronics	3	DM	X
ECE 69500 High-Speed Mixed-Signal IC	3	CD	

** Courses not currently available online could become available in the very near future*