VANDERBILT
School *of* Engineering

Electrical and Computer Engineering Electives (Areas of Concentration)
(2025-2026 Catalog Year)
21 hours (minimum)

Defined by a structure that includes the four Electrical and Computer Engineering Areas of Concentration listed below.

a. At least 15 hours selected from the Gateway courses* and ECE and CS Depth courses listed below.
b. Other courses listed in the Electrical and Computer Engineering Areas of Concentration below, or ECE or CS courses numbered above 3000 (including ECE 3860, 3861 and CS 3860, 3861).

Additional requirements for (a) and (b) include:

- At least 9 hours completed in one of the four Areas of Concentration listed below.
- At least 6 additional hours completed in a second distinct Area of Concentration listed below.
- At least one Design Domain Expertise course** as designated below taken before ECE 4951.
- Courses with associated labs require completion of both the lecture and lab portions to count as Electrical and Computer Engineering Electives.
- Courses count in only one Area of Concentration; they cannot be double counted.

Area 1: Photonics & Nanomaterials

Gateway Course*:

ECE 3233	Electromagnetics (3 hours) F

ECE and CS Depth Courses:

ECE 4283	Principles and Models of Semiconductor Devices (3 hours)
ECE 4284	Integrated Circuit Technology and Fabrication (3 hours) S
ECE 4288**	Optoelectronics (3 hours) S/even years
ECE 4334**	RF and Microwave Design (3 hours) S/even years
ECE 4335	Fundamentals of Quantum Engineering (3 hours) S

Non-ECE and Non-CS Depth Courses

BME 4100	Lasers in Surgery and Medicine (3 hours) F
ME 4265	Direct Energy Conversion (3 hours)
NANO 3000	Imaging Techniques in Nanoscale Engineering (3 hours) F
PHYS 2210	Classical and Modern Optics (3 hours)
PHYS 2660	Experimental Nanoscale Fabrication and Characterization (3 hours)
PHYS 3640	Physics of Condensed Matter (3 hours)

Area 2: Microelectronics

Gateway Course*:

ECE 3233	Electromagnetics (3 hours) F

ECE and CS Depth Courses:

ECE 4267	Power System Analysis (3 hours) S/odd years
ECE 4268	Distributed Electrical Energy Systems (3 hours) F/even years
ECE 4275	Microelectronic Systems (3 hours) S
ECE 4283	Principles and Models of Semiconductor Devices (3 hours)
ECE 4284	Integrated Circuit Technology and Fabrication (3 hours) S
ECE 4287	Engineering Reliability (3 hours) S/even years
ECE 4289	Spacecraft Systems (3 hours) S/odd years
ECE 4334**	RF and Microwave Design (3 hours) S/even years
ECE 4335	Fundamentals of Quantum Engineering (3 hours) S
ECE 4380**	Electronics II (3 hours) S
ECE 4385**	VLSI Design (3 hours) F

Note: The VU Undergraduate Catalog is the definitive source for all degree requirements. If there are differences between this document and the catalog, then the catalog will prevail.

Non-ECE and Non-CS Depth Courses
None.

Area 3: Embedded Computing & Cyber-Physical Systems
Gateway Courses*:

CS/ECE 2218/2218L	Microcontrollers & Laboratory (4 hours) S
CS/ECE 2281/2281L	Computer Architecture & Laboratory (4 hours)
CS/ECE 3251***	Intermediate Software Design (3 hours) F/S

ECE and CS Depth Courses:

CS/ECE 3265	Database Management Systems (3 hours)
CS/ECE 3274**	Modeling and Simulation (3 hours)
CS/ECE 4277	Cyber Security (3 hours) F
CS/ECE 4278**	Principles of Software Engineering (3 hours) F
CS 4279**	Software Engineering Project (3 hours) S
CS/ECE 4284**	Computer Systems Analysis (3 hours)
CS/ECE 4285	Network Security (3 hours)
CS 4288**	Web-based System Architecture (3 hours) F
ECE 4239	Cyber-Physical Systems: Foundations and Project (3 hours) S
ECE 4257	Control Systems I (3 hours) F
ECE 4275	Microelectronic Systems (3 hours) S
ECE 4356**	Digital Signal Processing (3 hours) S
ECE 4358**	Control Systems II (3 hours) S
ECE 4375/4375L**	Embedded Systems & Laboratory (4 hours) F
ECE 4377**	FPGA Design (3 hours) S/even years
ECE 4383**	Computer Networks (3 hours) F/S
ECE 4385**	VLSI Design (3 hours) F

Non-ECE and Non-CS Depth Courses

ME 4271	Robotics (3 hours)

Area 4: Signal, Image, Data, and Medical Systems
Gateway Courses*:

ECE 4356**	Digital Signal Processing (4 hours) S
ECE 4363	Applied Statistical Machine Learning (3 hours) F

ECE and CS Depth Courses:

CS/ECE 3251***	Intermediate Software Design (3 hours) F/S
CS/ECE 4260	Artificial Intelligence (3 hours) F
CS/ECE 4262	Foundations of Machine Learning (3 hours) S
CS 4266**	Topics in Big Data (3 hours) S
CS 4269**	Project in Artificial Intelligence (3 hours) S
ECE 4286	Audio Engineering (3 hours) F
ECE 4353**	Image Processing (4 hours) F
ECE 4354**	Computer Vision (3 hours) S
ECE 4370	Engineering for Surgery (3 Hours) F

Non-ECE and Non-CS Depth Courses

BME 3302+3302L	Biomedical Instrumentation II and Laboratory (4)
BME 4400	Foundations of Medical Imaging (3 hours) S
BME 4420	Quantitative and Functional Imaging (3 hours) F
ME 3204	Mechatronics (3 hours) S

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Area 1: Photonics & Nanomaterials

Gateway Course*:

ECE 3233	PHYS 1602; Corequisite: MATH 2400 or MATH 2420

ECE and CS Depth Courses:

ECE 4283	ECE 3235
ECE 4284	ECE 3235
ECE 4288**	ECE 3233 or equivalent
ECE 4334**	ECE 3233
ECE 4335	PHYS 1602 or PHYS 1912 or PHYS 2255

Non-ECE and Non-CS Depth Courses

BME 4100	PHYS 1602
ME 4265	ME 2220
NANO 3000	MATH 1301; CHEM 1602 or MSE 1500
PHYS 2660	None.
PHYS 2210	PHYS 1502 or PHYS 1602 or PHYS 1912; and MATH 1201 or MATH 1301
PHYS 3640	PHYS 2275 and PHYS 3200; Corequisite: PHYS 2255

Area 2: Microelectronics

Gateway Course*:

ECE 3233	PHYS 1602; Corequisite: MATH 2400 or 2420

ECE and CS Depth Courses:

ECE 4267	ECE 2213 or ECE 2214
ECE 4268	ECE 2112
ECE 4275	ECE 2112; ECE 2116 or ECE 2123
ECE 4283	ECE 3235
ECE 4284	ECE 3235
ECE 4287	ECE 3235 or ECE 4275
ECE 4289	ECE 3235 or ECE 4275
ECE 4334**	ECE 3233
ECE 4335	PHYS 1602 or PHYS 1912 or PHYS 2255
ECE 4380**	ECE 2213 or ECE 2214; ECE 3235
ECE 4385**	ECE 2116 or ECE 2123; ECE 3235

Non-ECE and Non-CS Depth Courses:
None.

Area 3: Embedded Computing & Cyber-Physical Systems

Gateway Courses*:

CS/ECE 2218 + 2218L	ECE 2116 or ECE 2123; CS 1101 or CS 1103 or CS 1104
CS/ECE 2281 + 2281L	CS 2201
CS/ECE 3251***	CS 2201

ECE and CS Depth Courses:

CS/ECE 3265	CS 2201
CS/ECE 3274**	CS 2201

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CS/ECE 4277	CS 3251
CS/ECE 4278**	CS 3251
CS 4279**	CS 4278
CS/ECE 4284**	CS 3281
CS/ECE 4285	CS 4283
CS 4288**	CS 3251
ECE 4257	ECE 2213 or ECE 2214 or ECE 3214
ECE 4275	ECE 2112; ECE 2116 or ECE 2123
ECE 4356**	MATH 2300
ECE 4358**	ECE 4257
ECE 4375/4375L**	ECE 2218, CS 2201
ECE 4377**	ECE 2116 or ECE 2123
ECE 4383	CS 3281 or ECE 4375
ECE 4385**	ECE 2116 or ECE 2123; ECE 3235

Non-ECE and Non-CS Depth Course:

ME 4271	MATH 2400 or MATH 2410 or MATH 2500 or MATH 2501 or MATH 2600

Area 4: Signal, Image, Data and Medical Systems

Gateway Courses*:

ECE 4356**	MATH 2300
ECE 4363	MATH 2810 or MATH 2820 or BME 2400

ECE and CS Depth Courses:

CS/ECE 3251***	CS 2201
CS/ECE 4260	CS 3250, CS 3251; MATH 2810 or MATH 2820 or MATH 3640
CS/ECE 4262	CS 3251; MATH 2810 or MATH 2820 or MATH 3640; MATH 2410 or MATH 2500 or MATH 2501 or MATH 2600
CS 4266**	CS 3251
CS 4269**	CS 4260
ECE 4286	ECE 2213 or ECE 2214; ECE 3235
ECE 4353**	CS 1101 or CS 1104; MATH 2400 or MATH 2410 or MATH 2501 or MATH 2600
ECE 4354**	ECE 4353
ECE 4370	CS 2201 or CS 2204

Non-ECE and Non-CS Depth Courses

BME 3302 + 3302L	BME 3301 or ECE 2213, ECE 2213L or ECE 2214, ECE 2112L
BME 4400	CS 1100 or CS 1101 or CS 1103 or CS 1104; PHYS 1602; MATH 2400
BME 4420	CS 1101 or CS 1103 or CS 1104; PHYS 1602; MATH 2400
ME 3204	ECE 2112; CS 1100 or CS 1101 or CS 1103 or CS 1104

*Gateway courses provide recommended background and/or prerequisites for the Area of Concentration Depth courses.

**Designates a Design Domain Expertise course.

***CS/ECE 3251 (Intermediate Software Design) is recommended in spring of the sophomore year as preparation for advanced computer science courses, with a technical elective taken in fall of the junior year. Otherwise, students may choose a technical elective in spring of the sophomore year and an ECE program elective in fall of the junior year.

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