

Electrical Engineering (BS), Renewable Electric Energy Systems Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

Core Courses

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Many of the core courses are offered three times a year in fall, spring, and summer. A strong emphasis is placed on fundamental concepts in core courses so that graduates are prepared for rapid technological changes common in the electrical and computer engineering professions. A comprehensive foundation in mathematics and the physical sciences in the freshman year is followed in subsequent years by additional core courses in mathematics, physics, electric circuit theory, digital logic, computer systems, electronics, electromagnetics, and linear systems. Laboratory work is designed to demonstrate fundamental principles and to provide experience in designing and testing electronic hardware and computer software. Both curricula have a required two semester senior design project which gives students comprehensive experience in designing, building, and testing physical systems.

Curricula

In addition to the core courses described above, students in the electrical engineering curriculum take two foundational electives and four specialization electives in areas of their choice within the discipline and two technical electives that can be in either electrical engineering or selected engineering courses offered by other departments. Beyond the core, students in the computer engineering curriculum take courses in discrete mathematics, data structures, embedded systems, and complex digital systems, in addition to four specialization electives in areas of their choice and one technical elective. For both curricula, a variety of elective courses are offered in communications, computational intelligence, controls, digital signal processing, digital systems, nanotechnology, mechatronics, microelectronics, networking, robotics, and VLSI design. There are typically a dozen or more of these courses offered each fall and spring semester and two or three available each summer.

Plan Requirements

Electrical Engineering (BS): Renewable Electric Energy Systems Concentration: 122 Total Units

Course	Title	Hours
First Year		
Fall Semester		
CH 101	Chemistry - A Molecular Science ¹	3
CH 102	General Chemistry Laboratory ¹	1
E 101	Introduction to Engineering & Problem Solving ²	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research ²	4

MA 141	Calculus I ¹	4
Hours		14

Spring Semester

ECE 109	Introduction to Computer Systems ²	3
MA 241	Calculus II ¹	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4

Select one of the following: 3

ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	

Hours 14

Second Year

Fall Semester

ECE 200	Introduction to Signals, Circuits and Systems ²	4
ECE 209	Computer Systems Programming ²	3
MA 242	Calculus III	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4

Hours 15

Spring Semester

COM 110	Public Speaking	3
ECE 211	Electric Circuits ²	4
ECE 212	Fundamentals of Logic Design ²	3
ECE 220	Analytical Foundations of Electrical and Computer Engineering ²	3

Hours 13

Third Year

Fall Semester

ECE 301	Linear Systems	3
ECE 302	Microelectronics	4
ST 371	Introduction to Probability and Distribution Theory	3

Hours 10

Spring Semester

ECE 303	Electromagnetic Fields	3
ECE 380	Engineering Profession for Electrical Engineers	1
ECE 305	Principles of Electromechanical Energy Conversion	3

Select one of the following: 3

E 304	Introduction to Nano Science and Technology	
ECE 306	Introduction to Embedded Systems	
ECE 308	Elements of Control Systems	
ECE 310	Design of Complex Digital Systems	

ENG 331	Communication for Engineering and Technology	3
Hours		13
Fourth Year		
Fall Semester		
Select one of the following:		3
ECE 482	Engineering Entrepreneurship and New Product Development I	
ECE 484	Electrical and Computer Engineering Senior Design Project I	
MAE 482	Engineering Entrepreneurship and New Product Development I	
ECE 452	Renewable Electric Energy Systems	3
REES Electives (p. 2)		6
Hours		12
Spring Semester		
Select one of the following:		3
ECE 483	Engineering Entrepreneurship and New Product Development II	
ECE 485	Electrical and Computer Engineering Senior Design Project II	
MAE 483	Engineering Entrepreneurship and New Product Development II	
ECE Elective		3
Open/Technical Electives		6
Hours		12
Total Hours		103

¹ A grade of C or higher is required.

² A grade of C- or higher is required.

Code	Title	Hours
GEP Courses		
	GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	6
	GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3
	GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2
	GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)	3
	GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	5
	GEP U.S. Diversity (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/) (verify requirement)	
	GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)	
	Foreign Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/) (verify requirement)	
Total Hours		19

REES Electives

Code	Title	Hours
ECE 434	Fundamentals of Power Electronics	3
ECE 451	Power System Analysis	3
ECE 453	Electric Motor Drives	3
ECE 533	Power Electronics Design & Packaging	3
ECE 534	Power Electronics	3
ECE 535	Design of Electromechanical Systems	3
ECE 550	Power System Operation and Control	3
ECE 551	Smart Electric Power Distribution Systems	3
ECE 553	Semiconductor Power Devices	3
ECE 581	Electric Power System Protection	3
ECE 583	Electric Power Engineering Practicum I	3
ECE 585	The Business of the Electric Utility Industry	3
ECE 586	Communication and SCADA Systems for Smart Grid	3
MAE 535	Design of Electromechanical Systems	3

ECE Electives

Code	Title	Hours
BME 418/518	Wearable Biosensors and Microsystems	3
BME 522	Medical Instrumentation	3
CHE 468/568/ ECE 468/568	Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems	3
CSC 406/506/ ECE 406/506	Architecture Of Parallel Computers	3
CSC 517	Object-Oriented Design and Development	3
CSC 547	Cloud Computing Technology	3
CSC 570	Computer Networks	3
CSC 573	Internet Protocols	3
CSC 574	Computer and Network Security	3
CSC 575	Introduction to Wireless Networking	3
CSC 576	Networking Services: QoS, Signaling, Processes	3
CSC 577	Switched Network Management	3
CSC 579	Introduction to Computer Performance Modeling	3
ECE 308	Elements of Control Systems	3
ECE 402	Communications Engineering	3
ECE 403	Electronics Engineering	3
ECE 404	Introduction to Solid-State Devices	3
ECE 407	Introduction to Computer Networking	3
ECE 418	Wearable Biosensors and Microsystems	3
ECE 420	Wireless Communication Systems	3
ECE 421	Introduction to Signal Processing	3
ECE 422	Transmission Lines and Antennas for Wireless	3
ECE 423	Introduction to Photonics and Optical Communications	3
ECE 424	Radio System Design	3
ECE 426	Analog Electronics Laboratory	3
ECE 434	Fundamentals of Power Electronics	3
ECE 436	Digital Control Systems	3
ECE 442	Integrated Circuit Technology and Fabrication	3
ECE 451	Power System Analysis	3

ECE 418	Wearable Biosensors and Microsystems	3
ECE 420	Wireless Communication Systems	3
ECE 421	Introduction to Signal Processing	3
ECE 422	Transmission Lines and Antennas for Wireless	3
ECE 423	Introduction to Photonics and Optical Communications	3
ECE 424	Radio System Design	3
ECE 426	Analog Electronics Laboratory	3
ECE 434	Fundamentals of Power Electronics	3
ECE 436	Digital Control Systems	3
ECE 442	Integrated Circuit Technology and Fabrication	3
ECE 451	Power System Analysis	3
ECE 453	Electric Motor Drives	3
ECE 455	Industrial Robotic Systems	3
ECE 456	Mechatronics	3
ECE 460	Embedded System Architectures	3
ECE 461	Embedded System Design	3
ECE 463	Microprocessor Architecture	3
ECE 464	ASIC and FPGA Design with Verilog	3
ECE 466	Compiler Optimization and Scheduling	3
ECE 470	Internetworking	3
ECE 488	Systems Biology Modeling of Plant Regulation	3
ECE 489	Solid State Solar and Thermal Energy Harvesting	3
ECE 492	Special Topics in Electrical and Computer Engineering	1-4
ECE 495	Individual Study in ECE	1-3
ECE 498	Special Projects in ECE	1-3
ECE 506	Architecture Of Parallel Computers	3
ECE 518	Wearable Biosensors and Microsystems	3
ECE 524	Radio System Design	3
ECE 556	Mechatronics	3
ECE 560	Embedded System Architectures	3
ECE 561	Embedded System Design	3
ECE 563	Microprocessor Architecture	3
ECE 564	ASIC and FPGA Design with Verilog	3
ECE 566	Compiler Optimization and Scheduling	3
ECE 588	Systems Biology Modeling of Plant Regulation	3
ECE 589	Solid State Solar and Thermal Energy Harvesting	3
ISE 311	Engineering Economic Analysis	3
MAE 201	Engineering Thermodynamics I	3
MAE 208	Engineering Dynamics	3
MAE 302	Engineering Thermodynamics II	3
MSE 489/589	Solid State Solar and Thermal Energy Harvesting	3
PB 488/588	Systems Biology Modeling of Plant Regulation	3
PY 489/589	Solid State Solar and Thermal Energy Harvesting	3

Semester Sequence

This is a sample.

Course	Title	Hours
First Year		
Fall Semester		
CH 101	Chemistry - A Molecular Science ¹	3

CH 102	General Chemistry Laboratory ¹	1
E 101	Introduction to Engineering & Problem Solving ²	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research	4
MA 141	Calculus I ¹	4
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		17

Spring Semester

ECE 109	Introduction to Computer Systems ²	3
MA 241	Calculus II ¹	4
PY 205	Physics for Engineers and Scientists I ¹	3
PY 206	Physics for Engineers and Scientists I Laboratory	1
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
EC 205	Fundamentals of Economics	3
Hours		15

Second Year

Fall Semester

ECE 200	Introduction to Signals, Circuits and Systems ²	4
ECE 209	Computer Systems Programming ²	3
MA 242	Calculus III	4
PY 208	Physics for Engineers and Scientists II	3
Hours		14

Spring Semester

COM 110	Public Speaking	3
ECE 211	Electric Circuits ²	4
ECE 212	Fundamentals of Logic Design ²	3
ECE 220	Analytical Foundations of Electrical and Computer Engineering ²	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		16

Third Year

Fall Semester

ECE 301	Linear Systems	3
ECE 302	Microelectronics	4
ST 371	Introduction to Probability and Distribution Theory	3
ECE 305	Principles of Electromechanical Energy Conversion	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
Hours		14

Spring Semester

ECE 303	Electromagnetic Fields	3
ECE 380	Engineering Profession for Electrical Engineers ³	1
REES Elective ⁴		3

Foundation Elective		3
ENG 331	Communication for Engineering and Technology	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		16
Fourth Year		
Fall Semester		
ECE 484	Electrical and Computer Engineering Senior Design Project I ³	3
REES Electives ⁴		3
ECE 452	Renewable Electric Energy Systems	3
Open/Technical Elective		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		15
Spring Semester		
ECE 485	Electrical and Computer Engineering Senior Design Project II ⁴	3
ECE Elective ⁵		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Open/Technical Electives		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		2-3
Hours		14-15
Total Hours		121-122

- ¹ A grade of C or higher is required.
- ² A grade of C- or higher is required.
- ³ Students in the entrepreneurs program should take ECE 383/ECE 482/ECE 483, instead of ECE 380/ECE 484/ECE 485.
- ⁴ Major GPAs greater than 3.5 are required to take 5xx courses.
- ⁵ Students with major GPAs greater than 3.5 can take 5xx courses