

Electrical Engineering, B.S.

Electrical and Computer Engineering Interim Chair: Dr. Maggie Wang
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About

- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Electrical Engineering, Honors

Electrical Engineering is traditionally associated with the generation and distribution of power. While this is still true today, the field has branched out into numerous areas that may not be easily identified with electrical engineering, such as radio frequency (RF) systems, telecommunications, remote sensing, signal processing, digital circuits, instrumentation, audio, video and optoelectronics, satellites, GPS, radar and navigation, biomedical engineering and devices as well as renewable energy sources. The Villanova electrical engineering curriculum touches upon every one of these technology areas.

Mission Statement

The mission of Villanova University's Department of Electrical and Computer Engineering is to empower students to become leaders in their chosen professions and to prepare them for a life of service to others.

Program Educational Objectives

The Program Educational Objectives of the Computer Engineering program are to produce graduates who:

- Use their knowledge, analytical, and design skills to generate and validate sustainable and technically appropriate solutions to practical real-world problems;
- Communicate and work effectively with others having different roles or responsibilities in their professional work environments;
- Continue to develop their professional knowledge and skills throughout their career;
- Succeed in their career by practicing their chosen discipline with professionalism, care, and integrity.

The curriculum is structured to provide a thorough foundation in the fundamentals of electrical and computer engineering. Analysis and design are emphasized throughout the curriculum, using a project-based structure to teach students how to work on their own and in teams and to synthesize engineering solutions by utilizing their analytical skills and knowledge. Heavy emphasis is placed on developing oral and written communication skills. The curriculum also provides opportunities for an increased awareness of the broader implications of technology and of the social responsibilities of the profession. The design process is emphasized throughout all four years, and design projects are included in the laboratory courses. The sophomore and junior years include core courses that provide a foundation for the senior year, which includes technical and professional electives and an in-depth design project.

The electrical engineering program offers technical elective courses in the following specialized areas: microwave networks and high-frequency circuit design, digital signal processing, linear integrated

electronics, communication electronics, optoelectronics, digital integrated electronics and microfabrication, embedded systems, control systems, electric machines and power systems, electronic measurement and conversion, and renewable energy systems.

Students in the electrical engineering program acquire experience with computers and their engineering applications, beginning with the engineering programming and applications course in the freshman year and continuing throughout the curriculum in the sophomore-level fundamentals courses, junior-level core courses, and senior-level technical electives.

In addition to the activities and services offered by the university and the College of Engineering, the Electrical and Computer Engineering (ECE) Department provides the following additional services and activities for its students: an academic advisor, to assist students with the implementations of their academic plans; the ECE Walk-in Tutoring Office, to assist ECE students with their upper-level courses; and college-level and departmental student organizations.

Program: [Engineering](#)

Type: Bachelor of Science

Freshman Year

First Semester

Course	Title	Credits
ACS 1000	Ancients	3
THL 1000	Faith, Reason, and Culture	3
MAT 1500	Calculus I	4
CHM 1103	General Chemistry Lab I	1
CHM 1151	General Chemistry I	4
EGR 1200	Engineering Design Cornerstone	3
EGR 1001	Career Compass IA	0.5

Second Semester

Course	Title	Credits
ACS 1001	Moderns	3
MAT 1505	Calculus II	4
PHY 2400	Physics I Mechanics	3
ECE 1205	ECE Freshman Projects	3
ECE 1260	EGR Prog and Applic	3
ECE 1261	EGR Prog and Applic Lab	1
EGR 1002	Career Compass IB	0.5

Sophomore Year

First Semester

Course	Title	Credits
ECE 2030	Electric Circuits Fundamentals	3
ECE 2031	Elect Circuit Fundamentals Lab	1
MAT 2705	Diff Equation with Linear Alg	4
PHY 2402	Physics II Elec & Magnet	3
PHY 2403	Phy Lab for Engineering	1
	Elective - Ethics	3
EGR 2003	Career Compass IIA	0.5

Second Semester

Course	Title	Credits
ECE 2292	Engineering Probability&Stats	3
ECE 2430	Embedded Systems	3
ECE 2431	Embedded Systems Lab	1
ECE 2530	Analog Electronics I	3
ECE 2531	Analog Electronics I Lab	1
MAT 2500	Calculus III	4
EGR 2004	Career Compass IIB	0.5

Junior Year

First Semester

Course	Title	Credits
ECE 2172	Digital Systems	3
ECE 2173	Digital Systems Lab	1
ECE 3020	Intro to Electric Energy Syste	3
ECE 3242	Fundamentals of Signal Process	3
ECE 3530	Analog Electronics II	3
ECE 3531	Analog Electronics II Lab	1
	Elective - Free	3
EGR 3005	Career Compass IIIA	0.5

Second Semester

Course	Title	Credits
ECE 3000	Engr Systems Models & Control	3
ECE 3001	Engr Systems Model&Control Lab	1
ECE 3030	Engr Electromagnetics	3
ECE 3031	Engr Electromagnetics Lab	1
ECE 3040	Electrical Communications	3
ECE 3970	Design Seminar - EE	2
	Elective - Free	3
EGR 3006	Career Compass IIIB	0.5

Senior Year

First Semester

Course	Title	Credits
ECE 4970	Design Project - EE	3
	Elective - EE Track	3
	Elective - Science, Technical or Math	3
	Elective - Free	3
	Elective - Humanities	3

Second Semester

Course	Title	Credits
ECE 4972	Design Project Report - EE	1
	Elective - EE Track	3
	Elective - Free	3
	Elective - Free	3
	Elective - THL (2000 or above)	3
	Elective - ECE 5000 or above	3

Category Descriptions

Elective - Ethics

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

Choose one of the following:

Course	Title	Credits
CRM 1001	Introduction to Criminology	3
ETH 2050	The Good Life:Eth & Cont Prob	3
PHI 2115	Ethics for Health Care Prof	3
PHI 2121	Environmental Ethics	3
PHI 2130	Business Ethics	3
PHI 2155	Engineering Ethics	3
PHI 2180	Computer Ethics	3
PHI 2550	Technology & Society	3
PHI 4125	Bioethics	3
PJ 5400	Ethics, Justice and the Family	3
NS 4200	Leadership and Ethics	3
SBI 2006	Corporate Responsibility	3
VSB 2007	Corp Respon & Regulation	3

Elective - Free

Credits: 3

Any Villanova three credit course or Villanova courses that when combined add up to three credits (for example, three 1-credit Honors courses)

Elective - EE Track

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

Track Electives chosen from one of following tracks: Biomedical Engineering, Electric Energy Systems, Embedded Systems and Control, High Frequency Electronics, Signal Processing.

Biomedical Engineering

Foundation Course: [ECE 3242](#)

Faculty Advisor: Dr. Meltem Izzetoglu

Course	Title	Credits
ECE 5250	Biomedical Instrumentation	3
ECE 5251	Biomedical Signal Processing	3
ECE 5252	Medical Imaging	3
ECE 5770	Organs-on-a-Chip	3

Electric Energy Systems

Foundation Course: [ECE 3020](#)

Faculty Advisor: Dr. Pritpal Singh

Course	Title	Credits
ECE 5815	Power System Analysis	3
ECE 5850	Renewable Energy Systems	3
ECE 7000	Renewable Energy Policy	3

Embedded Systems and Control

Foundation Courses: [ECE 3000](#) & [ECE 3001](#)

Faculty Advisor: Dr. Peyton Jones

Course	Title	Credits
ECE 5390	Control System Design	4
ECE 5450	Microcontrollers & Applic	3

High Frequency Electronics

Foundation Courses: [ECE 3030](#) & [ECE 3530](#)

Faculty Advisor: Dr. Ahmad Hoorfar

Course	Title	Credits
ECE 5690	Microwave Networks	4
ECE 5730	RF Circuit Design	3

Signal Processing

Foundation Course: [ECE 3242](#)

Faculty Advisor: Dr. Mojtaba Vaezi

Course	Title	Credits
ECE 5040	Deep Lrning Methd Wireless Com	3
ECE 5251	Biomedical Signal Processing	3

Elective - Science, Technical or Math

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

Choose one of the following:

- **AST 1072, 1074, [2120](#), [2121](#), [2122](#), [2123](#).**
- BIO 1055 through 9999
- CEE 2000 through 9999
- CHE 2000 through 9999
- CHM 1152 through 9999
- CSC 1152 through 9999
- ECE (a course in addition to the required ECE courses in the curriculum)
- [ECO 3138](#)
- [GEV 1050](#), [1051](#), [1750](#)
- [MAT 2600](#), 3000 through 9999
- [ME 2100](#), [2101](#), [3100](#), [3102](#), [5411](#), [5421](#)

- [MET 1221, 1222](#)
- [MIS 2020, 2030, 2040, 3020, 3030, 3050](#)
- [NS 3100](#)
- [PHY 2414, 2416](#), 4000 through 9999

Elective - Humanities

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

One three credit course from:

- Theology (THL) course or course with CTHL (Core Theology) attribute, at the 2000 level or above
- Philosophy (PHI)
- Peace and Justice (PJ)
- [ETH 2050 - The Good Life: Ethics & Cont Prob](#)
- [EGR 2930 - Catholic Social Teaching for EGRs](#)
- Any Humanities or Social Science course with a PJ (Peace and Justice) attribute.

Elective - THL (2000 or above)

Credits: 3

Theology (THL) course or course with CTHL (Core Theology) attribute, at the 2000 level or above.

Elective - ECE 5000 or above

Credits: 3

Any ECE course at the 5000 level or above.