

# The Department of Engineering

## Computer Engineering, B.S.

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## About

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

Computer Engineering is a discipline that bridges the fields of Computer Science and Electrical Engineering. It may be simplistic to state that computer engineers “build computers,” but it is not far from the truth. Computer engineers are unique in having the balanced skills to bring the hardware and software work together. Building computers alone does not begin to describe the scope of computer engineering. Computers are now embedded in smart phones, drones, wireless networks, internet devices, autonomous vehicles and are an integral part of AI, cybersecurity and machine learning. The Villanova computer engineering program is a balanced program bringing together such fundamentals as computer architecture, networks, operating systems, digital electronics, embedded systems as well as electives in biomedical engineering, machine learning and cybersecurity.

## 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 in their chosen profession;
- 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 careers 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 computer engineering curriculum not only provides a solid foundation in the core fundamentals but offers the flexibility for students to pursue other professional interests. The curriculum includes professional electives, free elective, science/math elective, computer engineering track electives, and humanities electives to serve this purpose. Students have used this flexibility to pursue minors in business, mechatronics, computer science, cognitive science, physics, astronomy, mathematics, foreign languages, history, and theology, to name a few; although, applying these electives towards a minor/concentration is not a requirement. In addition, students have used the flexibility of the curriculum to prepare for post-graduate study in medicine, law, business, education, and engineering.

The computer engineering program offers technical elective courses in the following specialized areas: computer architecture, biomedical engineering, computer networks, machine learning, microcontrollers, digital integrated electronics and microfabrication, embedded systems, and computer security.

Students in the computer 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.

## Freshman Year

### First Semester

Course	Title	Credits
ACS 1000	Ancients	3
THL 1000	Faith, Reason, and Culture	3
CHM 1103	General Chemistry Lab I	1
CHM 1151	General Chemistry I	4
MAT 1500	Calculus 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 2170	Fundamentals of CPE	3
ECE 2171	Fundamentals of CPE Lab	1
ECE 2160	C++ Algorithms & Data Struct	3
ECE 2161	C++ Algorithms&Data Struct Lab	1
MAT 2705	Diff Equation with Linear Alg	4
CSC 1300	Discrete Structures	3
CSC 2014	Java Bootcamp	1
EGR 2003	Career Compass IIA	0.5

## Second Semester

Course	Title	Credits
ECE 2030	Electric Circuits Fundamentals	3
ECE 2031	Elect Circuit Fundamentals Lab	1
ECE 2172	Digital Systems	3
ECE 2173	Digital Systems Lab	1
PHY 2402	Physics II Elec & Magnet	3
	Elective - Ethics	3
	Elective - Math/Science	3
EGR 2004	Career Compass IIB	0.5

# Junior Year

## First Semester

Course	Title	Credits
CSC 1700	Analysis of Algorithms	3
ECE 2292	Engineering Probability&Stats	3
ECE 3170	Computer Architecture	3
ECE 3171	Computer Architecture Lab	1
ECE 3450	Digital Electronics	3
	Elective - THL (2000 or above)	3
EGR 3005	Career Compass IIIA	0.5

## Second Semester

Course	Title	Credits
ECE 3180	Computer Networks	3
ECE 3242	Fundamentals of Signal Process	3
ECE 3476	Computer and Network Security	3
ECE 3600	Operating Systems	3
ECE 3971	Design Seminar - CPE	2
EGR 3006	Career Compass IIIB	0.5

# Senior Year

## First Semester

<b>Course</b>	<b>Title</b>	<b>Credits</b>
ECE 4971	Design Project - CPE	3
	Elective - Technical	3
	Elective - Humanities	3
	Elective - Free	3
	Elective - Free	3

## Second Semester

<b>Course</b>	<b>Title</b>	<b>Credits</b>
ECE 4973	Design Project Report - CPE	1
	Elective - Technical	3
	Elective - Free	3
	Elective - Free	3
	Elective - Free	3