

COLLEGE OF ENGINEERING

Gary A. Gabriele, Ph.D., Dean

Gerard F. "Jerry" Jones, Ph.D., Associate Dean, Academic Affairs

Stephen Jones, Ph.D., Associate Dean, Student and Strategic Programs

Alfonso Ortega, Ph.D., Acting Associate Dean, Graduate Studies and Research

Office: 310 CEER, tel. 610-519-4940

Website: www.engineering.villanova.edu

HISTORY

The second degree granting unit inaugurated at Villanova University was the College of Engineering, which began instruction in 1905 under the name of the School of Technology. It was the fourth engineering program to be established at a Catholic school of higher education in the United States (after The Catholic University of America, 1896, Manhattan College, 1896, and the University of Notre Dame, 1897). Dr. A.B. Carpenter, a graduate of Lehigh University, was hired in 1904 to organize and direct the School. He was ably assisted by Rev. James J. Dean, a young faculty member in the sciences. It was their responsibility to develop the curricula, hire faculty and plan the facilities needed. Programs in Civil and Electrical Engineering were the first to be initiated, with a total of twelve students enrolled. In 1908, an undergraduate program in Mechanical Engineering was established; and in 1909, the first engineering bachelor's degrees were awarded. An undergraduate program in Chemical Engineering was established in 1919. In the years following the Second World War, the College expanded its degree offerings to the masters level, establishing graduate programs in each of its four engineering departments.

A fifth undergraduate degree program in Computer Engineering was added in 1993. A combined Bachelors/Masters Program is available in all programs. In 2003, an Interdisciplinary Doctoral Program was instituted. The undergraduate programs of Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, and Mechanical Engineering (all of the undergraduate engineering programs at Villanova) are accredited by the Accreditation Commission (EAC) of ABET (Accreditation Board for Engineering and Technology), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone (410) 347-7700. There are two research units in the College: The Center for Advanced Communications (CAC), and The Center for Nonlinear Dynamics and Control (CENDAC). The college also has extensive research programs in environmental engineering, including waste water treatment and storm water management, as well as a well recognized research program in alternative energy technology..

MISSION STATEMENT

Villanova University's College of Engineering is committed to an educational program that emphasizes technical excellence and a liberal education within the framework of the University's Augustinian and Catholic traditions. As a community of scholars, we seek to educate students to pursue both knowledge and wisdom, and to

aspire to ethical and moral leadership within their chosen careers, their community, and the world.

We value a spirit of community among all members of the college that respects academic freedom and inquiry, the discovery and cultivation of new knowledge, and continued innovation in all that we do.

OBJECTIVES

The College of Engineering strives to prepare its graduates to understand their roles in and make constructive contributions to a technological society, and to provide ethical and moral leadership in their profession and communities. These objectives are accomplished by various methods, but primarily by integrating into the curriculum the values and morality of the University's Augustinian heritage. In addition to being professionally competent, graduates are expected to have an understanding of their professional and ethical responsibilities, the impact on engineering solutions in a global and societal context, a knowledge of contemporary issues, and an appreciation of humanistic concepts in literature, the arts, and philosophy.

The College pursues these objectives by stressing:

- Excellence in teaching
- Faculty development through research and professional activities
- Emphasis on the design process so that the students are exposed to real-world situations
- Graduating students with the following attributes:
 - Ability to apply scientific and mathematical concepts and principles to identify, formulate, and solve problems in real-world context
 - Ability to plan and conduct experimental investigations, and to analyze and interpret their results
 - Ability to be an effective member of a project team
 - Ability to communicate ideas and information
 - Understanding of the role of the engineering profession and technology, including appreciation of concepts drawn from the humanities and social sciences
 - Development of high professional and ethical standards
 - Motivation and capability to acquire, evaluate, and assimilate knowledge and continue the learning experience

DEGREES OFFERED

The College of Engineering offers full-time (day) academic programs leading to the following degrees: Bachelor of Science in Chemical Engineering, Bachelor of Science in Civil Engineering, Bachelor of Science in Computer Engineering, Bachelor of Science in Electrical Engineering, and Bachelor of Science in Mechanical Engineering.

The undergraduate programs of Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, and Mechanical Engineering (all of the undergraduate engineering programs at Villanova) are accredited by the Accreditation Commission (EAC) of ABET..

DEGREE REQUIREMENTS

The undergraduate engineering curriculum provides the foundation for careers in engineering as well as the basis for further study in engineering and other professions such as law, medicine, and management. Courses of study concentrate on mathematics, physics, chemistry, engineering science, and engineering analysis and design within a particular engineering discipline.

The curriculum places special emphasis upon developing oral and written communication skills, and it offers opportunities to develop an appreciation of the social sciences and humanities, and the flexibility to pursue minors. Courses in the humanities are included in each curriculum to make the student engineer more fully aware of social responsibilities and better able to consider non-technical factors in the engineering decision making process. Extensive hands-on laboratory experience leads to required projects for all seniors to ensure professional preparation in the fundamentals of the design process within the real constraints of problem solving. In order to qualify for a bachelor's degree in the College of Engineering, undergraduate engineering students must successfully complete all of the first year core curriculum courses, those major courses required for the particular engineering degree sought, and a series of electives, as indicated in the following sections. They must also achieve cumulative overall and technical grade point averages of at least 2.00 in their course work.

At least half of all the engineering courses and, normally, the final 30 credits of an engineering bachelor's degree program, must be taken at Villanova University. All undergraduate degree requirements should normally be completed within a six-year period. NOTE: It is the responsibility of each student to know and to fulfill all degree requirements. In order to keep the curriculum abreast of the latest engineering developments, Villanova University reserves the right to change the program requirements without prior notice.

CORE CURRICULUM FOR STUDENTS ENTERING IN FALL 2010 OR LATER

Freshman Year						
First Semester		Credits		Second Semester		Credits
CHM 1151	General Chemistry	4		CHM 1156	General Chemistry II for Engineers ²	4
CHM 1103	General Chemistry Laboratory I	1		ACS 1001 ¹	Modernity and Its Discontents	3
ACS 1000 ¹	Traditions in Conversation	3		EGR 1205	Interdisciplinary Projects II	3
EGR 1200	Interdisciplinary Projects I	3		MAT 1505	Calculus II	4
MAT 1500	Calculus I	4		PHY 2400	Physics I, Mechanics	3
THL 1050 or THL 1051	Christian Theology, an Introduction or Christianity in History	3				

NOTE ¹: This course may be taken in either semester.

NOTE ²: Students electing to major in Electrical Engineering or Computer Engineering are required to substitute ECE 1620 Engineering Programming & Applications.

ENGINEERING CURRICULUM ELECTIVE REQUIREMENTS IN HUMANITIES AND SOCIAL SCIENCE

In addition to required Freshman Year courses and specified courses for each degree program, candidates for degrees in engineering must successfully complete 12 credits from the following:

- THL 1050 Christian Theology: an Introduction or THL 1051 Christianity in History. This course is normally taken in Freshman Year as part of the Core Curriculum.
- One 3-credit Theology course at the 2000 level or above.
- Two additional 3-credit courses chosen from among the following:
 - o Theology courses at the 2000 level or above
 - o Any Philosophy course
 - o Any Peace and Justice course
 - o ETH 2050 Ethical Traditions and Contemporary Life
 - o EGR 2001 Engineering: The Humanistic Context. (This course is required in some programs. Students should consult adviser.)

Note: one of these two 3 credit courses must be fulfilled by an Ethics course. Refer to departments' specific lists of Ethics courses for options.

ELECTIVES

All students select their remaining humanities and social science electives from among the courses listed in the University catalog and offered by the following departments.

Humanities	Social Sciences
Arab & Islamic Studies Art History (except skills courses) Classical Studies Communication (except skills courses) English (Literature) History Honors Program (for eligible students only) Humanities Modern Languages (except speaking courses in native language) Philosophy Theatre (except skills courses) Theology (2000 and above)	Economics Geography and the Environment * Humanities (HUM courses designated as PSC) Peace and Justice Political Science Psychology Sociology Gender and Women's Studies * * Selected courses

Courses primarily emphasizing skills (such as acting, painting, sculpting, public speaking, etc.) are not acceptable. Students should consult their Department Chair.

DECLARATION OF MAJOR

All engineering students are enrolled in a common freshman year curriculum with the exception of a second semester science requirement which is program dependent. By the end of February of freshman year, all freshman engineering students are required to declare their major field of study, i.e., Chemical, Civil, Computer, Electrical, or Mechanical Engineering.

Engineering students who wish to change their major within the College of Engineering must contact the chairperson of the department in which they are interested. The Chair will arrange for the review of the student's academic record and notify the student of the decision. The department will then notify the College of the change for its records. Students who are unsure of which major they would like to enroll in should arrange to meet with their academic adviser to discuss their options.

Engineering students who wish to change their major to an area outside of engineering must apply for admission to the dean of the college offering that program.

Students who wish to change their major to Engineering from another college within the university, must contact the Associate Dean of Academic Affairs in the College of Engineering.

DEGREE PROGRAMS

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

The chemical engineer typically uses the principles of mathematics, chemistry, physics and engineering sciences often with biology to creatively solve technical and commercial problems arising in industries which manufacture products by chemical reactions. These solutions must respond to economic constraints as well as social, ethical, environmental and safety implications. The chemical engineer may also apply these principles in related fields where the management of chemical transformations is important, such as preservation of the environment, pharmaceutical manufacturing, bio-engineering or the creation of new medical technology. Finally, the chemical engineer can apply understanding of fundamental principles to fields that interact indirectly with chemical technology, such as industrial management and patent law.

Program Educational Objectives - Consistent with the University's Augustinian Mission that values broadly-educated, and well-rounded individuals, the Program Educational Objectives of the Chemical Engineering Department are to produce Chemical Engineering graduates who:

- ❑ Apply the scientific principles underlying technology and possess the technical skills needed to contribute to the chemical engineering profession immediately at an entry level.
- ❑ Enter related professions, should they choose to do so, including professions that require further education.
- ❑ Display personal and interpersonal skills, such as effective communication and multidisciplinary team interactions, that facilitate the effective practice of their profession.
- ❑ Recognize the importance of, and have the ability to, engage in lifelong learning.
- ❑ Continue to learn and grow professionally, and who take advantage of professional opportunities as they arise to enhance their career.

Curricular Philosophy. The early years of the chemical engineering curriculum emphasize the basic principles of natural and engineering sciences. Later courses use these principles to develop skill in chemical engineering design - the solving of non-routine, open-ended problems requiring the exercise of judgment, and constrained by economic, safety, reliability or other requirements. Courses gradually develop the students' abilities, with the complexity of design experiences systematically increasing throughout the required courses in chemical engineering science, and culminating in the senior process design course.

Electives in the sophomore, junior, and senior years allow the student to tailor the program toward career goals. In the senior year, the student develops the ability to work independently by carrying out a chemical engineering project. All stages of the curriculum apply computers in various modes, ranging from programming personal computers for the solution of simple problems, through the use of computers for process monitoring and control, to the use of sophisticated software packages for process design. The curriculum includes several chemical engineering and science electives, to be chosen from a list of approved courses under the guidance of a faculty member designated as the

student's academic adviser. See www.villanova.edu/engineering/departments/chemical/ for details.

Program of Studies

Sophomore Year						
First Semester		Credits		Second Semester		Credits
CHE 2031	Intro. Chemical Processes	3		CHE 2032	ChemE Thermodynamics I	3
CHM 2211	Organic Chemistry I	3		CHE 2232	Fluid Mechanics	3
CHM 2201	Organic Chemistry Lab I	1			Science Elective ²	3
MAT 2705	Differential Equations with Linear Algebra	4			Science Lab Elective ²	1
	Humanities/Social Science Elective ¹	3			Humanities/Social Science Elective ¹	3
	Humanities/Social Science Elective ¹	3			Open Elective	3

Junior Year						
First Semester		Credits		Second Semester		Credits
CHE 3031	Heat Transfer	3		CHE 3032	Mass Transfer	3
CHE 3131	ChemE Thermodynamics II	3		CHE 3332	ChemE Reactor Engineering I	3
CHE 3931	Technical Communications	3		CHE 3932	ChemE Lab I	3
	ChemE Elective ²	3			Science Elective ²	3
	Science Elective ²	3			Open Elective	3
	Science Lab Elective ²	1				

Senior Year						
First Semester		Credits		Second Semester		Credits
CHE 4131	Process Design I	3		CHE 4232	Chemical Process Control	3
CHE 4331	Process Modeling & Analysis	3			ChemE Elective ²	6
CHE 4931	ChemE Lab II	3			Humanities/Social Science Elective	3

	ChemE Elective ²	3			Open Elective	3
	Humanities/Social Science Elective ¹	3				

¹Refer to the College of Engineering section on Humanities/Social Science electives.

²Science, Humanities/Social Science, Open, and ChemE Elective slots may be moved.

Chemical Engineering Electives (4)

Courses may be taken all in one area or selected from among different areas

Advanced Chemical Engineering

Modeling and Numerical Methods II

Transport Phenomena

Process Control Theory

Chemical Engineering Economics

Chemical Reactor Engineering II

Process Design II

Advanced Materials Engineering

Introduction to Material Science

Nanomaterials/Surface Science

Polymer Science and Engineering

Biomaterials

Biological Engineering Systems

Introduction to Biotechnology

Bioseparations

Biomaterials

Sustainable Engineering Systems

Introduction to Air Pollution Control

Climate Change & Sustainability

Life Cycle/Impact Assessment

Research

Chemical Engineering Research I

Chemical Engineering Research II

Note: Students must take both research courses if selected. Only ChemE Research I counts as a chemical engineering elective. ChemE Research II counts as an open elective.

Science (3) and Science Lab (2) Electives

One Science and Science Lab Elective must be CHM 2212 and CHM 2202 or CHM 3416 and CHM 3402.

Approved Science Electives: BIO 2101, BIO 2103, BIO 2105, BIO 2106, BIO 3105, BIO 3351, BIO 3595, BIO 4205, BIO 4505, CHM 2212, CHM 3416, CHM 3417, CHM 3511, CHM 3514, CHM 4611, CHM 4621, CHM 4622, CHM 4623, PHY 2402, PHY 2416, PHY 3310, PHY 4000, PHY 4002, PHY 4100, PHY 4102, PHY 5100, PHY 5102, PHY 5200, PHY 5300, PHY 5500, PHY 5502.

Approved Science Lab Electives:

BIO 2101, BIO 2104, CHM 2202, CHM 3402, CHM 3501, CHM 3503, CHM 3505, CHM 3506, CHM 4601, CHM 4603, PHY 2403, PHY 2417, PHY 3311, PHY 4001, PHY 4003.

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Civil engineers are involved in the planning, design, construction, and operation of facilities essential to modern life such as dams, bridges, highways, buildings, airports, harbors, river and shore protection, drinking water supplies, wastewater treatment, solid and hazardous waste management and disposal, offshore structures, and space platforms.

Because these projects are often of a magnitude that affects large segments of the population, the responsibility of the civil engineer extends beyond mere physical facilities into the social, political, and economic welfare of those they serve.

Mission Statement: Our mission is to provide our students with a high quality, contemporary, broad-based civil engineering education within a Judaeo-Christian, humanistic context preparing our students for professional practice, graduate study, and life-long learning.

Program Educational Objectives - Upon graduation from the Civil Engineering program at Villanova University, graduates are prepared to:

- Use their broad-based civil engineering backgrounds to perform as entry-level engineers in general civil engineering or in environmental, geotechnical, structural, transportation, or water resources engineering.
- Enter graduate school in the disciplines listed above or closely related disciplines, as well as other fields such as business and law.
- Continue the process of life-long learning as required for long-term personal and professional growth.
- Recognize their professional and ethical responsibilities to society as members of the engineering professional community.
- Use communication, computer, and teamwork skills to help themselves and their employers succeed.
- Relate their personal and professional lives to the Judaeo-Christian, humanistic tradition.

The broad-based curriculum provides flexibility and meets student needs through a selection of electives. More information on the Civil Engineering program can be found at the Department website www.villanova.edu/engineering/departments/civil/.

Program of Studies

Sophomore Year						
First Semester		Credits		Second Semester		Credits
CEE 2105	Mechanics I	4		CEE 2106	Mechanics II	4
CEE 2602	Civil Egr. Measurements	3		CEE 2311	Environmental Egr. Science	3
MAT 2500	Calculus III	4		MAT 2705	Differential Equations with Linear Algebra	4
PHY 2402	Physics II: Electricity and Magnetism	3		CEE 2211	Transportation Engineering	3
GLY 2805	Geology for Engineers	3			Free Elective	3

Junior Year						
First Semester		Credits		Second Semester		Credits
CEE 2107	Mechanics III	4		CEE 3412	Structural Design	3
CEE 3321	Water & Wastewater Treatment	3		CEE 3511	Hydraulic Egr. & Hydrology	3
CEE 3401	Structural Analysis	3		CEE 3801	Soil Mechanics	3
CEE 3704	CE Numerical & Statistical Analysis	3		CEE 3901	Soil Mechanics Laboratory	1
CEE 3921	Environmental Egr. Laboratory	1		CEE 3912	Structural Egr. Laboratory	1
	Humanities: THL \geq 2000	3			Humanities Elective from THL, PHI, PJ, ETH 2050	3

Senior Year						
First Semester		Credits		Second Semester		Credits
CEE 4601	CEE Professional Practice	3		CEE 4606	CEE Capstone Design Project	3
CEE 4701	Economy and Risk	3		EGR 2001	Engineering: Humanistic Context ³	3
	CEE Senior Electives ¹	9			Social Science Elective from ECO, GEV (Geography Courses), PJ, PSC, PSY, SOC, WS	3
	Technical Elective ²	3			Humanities Elective	3
					Free Elective	3
					Technical Elective ²	3

¹CEE Senior Electives include:

- CEE 4224 Transportation Facilities Design
- CEE 4331 Solid & Hazardous Waste
- CEE 4412 Advanced Structural Engineering
- CEE 4521 Water Resources Engineering Design
- CEE 4801 Foundation Design

²Technical Electives include

- CEE 3235 Advanced Transportation Engineering
- CEE 4608 Project & Construction Management
- CEE 4612 CEE Undergraduate Research
- GEV 1050/1051 Environmental Science I/II
- GEV 4101 Geographic Information Systems
- GEV 5100 Resource Management & Conservation
- GEV 5300 Disasters: Natural Hazards

and other courses listed in this catalog and offered by the following departments: Astronomy, Biology, Chemistry, Chemical Engineering, Civil and Environmental Engineering, Computing Sciences, Electrical and Computer Engineering, Mathematical Sciences, Mechanical Engineering, and Physics. The selection must be done with the advice and approval of the student's adviser and chair.

³EGR 2001 fulfills the College Ethics requirement.

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

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

- can use their knowledge, analytical, and design skills to generate and validate appropriate solutions to practical real world problems.
- can communicate and work effectively with others having different roles or responsibilities.
- continue to develop their professional knowledge and skills throughout their career.

- have successful careers, and practice their chosen discipline with professionalism, care, and integrity.

The curriculum is structured to provide a thorough foundation in the fundamentals of computer engineering. Design and analysis are emphasized throughout the curriculum, using a project-based structure to teach students how to learn on their own and in teams, and synthesize new engineering solutions by using their knowledge and analytical skills. Great importance is placed on developing oral and written communications skills. The curriculum also provides opportunities for an increased awareness of the broader implications of technology and of the social responsibilities of the profession. These Program Educational Objectives are met by satisfying the following outcomes:

- A. An ability to apply knowledge of mathematics, science, and engineering
- B. An ability to design and conduct experiments, as well as to analyze and interpret data
- C. An ability to design a system, component, or process to meet desired needs
- D. An ability to function on multi-disciplinary teams
- E. E. An ability to identify, formulate, and solve engineering problems
- F. F. An understanding of professional and ethical responsibility
- G. G. An ability communicate effectively
- H. The broad education necessary to understand the impact of engineering solutions in a global and societal context
- I. A recognition of the need for, and an ability to engage in life-long learning
- J. A knowledge of contemporary issues
- K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Further details of these educational objectives and the program outcomes are available at the website of the Electrical and Computer Engineering Department.

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, digital signal processing, computer networks, multimedia systems, 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 adviser, to assist students with the implementations of their academic plans; the annual ECE Day program and dinner, to highlight state-of-art topics in the electrical and computer engineering professions; the ECE Walk-in Tutoring Office, to assist ECE students with their upper-level courses; and college-level and departmental student organizations.

Program of Studies

Sophomore Year						
First Semester		Credits		Second Semester		Credits
ECE 2042	Fundamentals of Computer Engineering I	3		ECE 2044	Fundamentals of Computer Engineering II	3
ECE 2043	Fundamentals of Computer Engineering I Lab	1		ECE 2045	Fundamentals of Computer Engineering II Lab	1
ECE 2409	Fundamentals of MATLAB	2		ECE 2052	Fundamentals of Electrical Engineering I	3
ECE 2620	C++ Programming, Algorithms & Data Structures	4		ECE 2053	Fundamentals of Electrical Engineering I Lab I	1
ECE 2900	Intro to Electrical and Computer Engineering	1		ECE 3445	Computer Architecture	3
MAT 2705	Differential Equations with Linear Algebra	4		CSC 1300	Discrete Structures	3
	Humanities: THL _≥ 2000	3			Science or Mathematics Elective	3

Junior Year						
First Semester		Credits		Second Semester		Credits
ECE 3720	Engineering Probability Statistics	3		CSC 4181	Compiler Construction	3
CSC 1600	Operating Systems	3		ECE 3240	Discrete-Time Signals and Systems	4
ECE 3450	Digital Electronics	3		ECE 3971	Design Seminar - CPE	2
ECE 3900	Professional Development Seminar	2		ECE 4470	Computer Networks	4
	Science or Mathematics Elective	3			CPE Technical Elective*	3

Senior Year						
First Semester		Credits		Second Semester		Credits
ECE 4971	Design Project - CPE	3		ECE 4973	Design Project Report - CPE	1
	CPE Technical Elective*	3			CPE Technical Elective*	3
	Professional Electives***	6			Professional Electives***	6
	Ethics Elective**	3			Humanities Elective from THL, PHI, ETH, PJ, EGR 2001	3
					Free Elective	3

* Technical Electives chosen from the ECE Departmental list of approved courses.

**Ethics-based Elective chosen from the ECE Departmental list of approved courses.

*** Professional Electives, pre-approved by student's Academic Adviser, for the pursuit of minors, concentrations, and other academic plans.

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

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

- can use their knowledge, analytical, and design skills to generate and validate appropriate solutions to practical real world problems.
- can communicate and work effectively with others having different roles or responsibilities.

- ❑ continue to develop their professional knowledge and skills throughout their career.
- ❑ have successful careers, and practice their chosen discipline with professionalism, care, and integrity.

The curriculum is structured to provide a thorough foundation in the fundamentals of computer engineering. Design and analysis are emphasized throughout the curriculum, using a project-based structure to teach students how to learn on their own and in teams, and synthesize new engineering solutions by using their knowledge and analytical skills. Great importance is placed on developing oral and written communications skills. The curriculum also provides opportunities for an increased awareness of the broader implications of technology and of the social responsibilities of the profession. These Program Educational Objectives are met by satisfying the following outcomes:

- L. An ability to apply knowledge of mathematics, science, and engineering
- M. An ability to design and conduct experiments, as well as to analyze and interpret data
- N. An ability to design a system, component, or process to meet desired needs
- O. An ability to function on multi-disciplinary teams
- P. E. An ability to identify, formulate, and solve engineering problems
- Q. F. An understanding of professional and ethical responsibility
- R. G. An ability communicate effectively
- S. The broad education necessary to understand the impact of engineering solutions in a global and societal context
- T. A recognition of the need for, and an ability to engage in life-long learning
- U. A knowledge of contemporary issues
- V. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Further details of these educational objectives and the program outcomes are available at the website of the Electrical and Computer Engineering Department.

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 adviser, to assist students with the implementations of their academic plans; the annual ECE Day program and dinner, to highlight state-of-art topics in the electrical and computer engineering professions; the ECE Walk-in Tutoring Office, to assist ECE students with their upper-level courses; and college-level and departmental student organizations.

Program of Studies

Sophomore Year						
First Semester		Credits		Second Semester		Credits
ECE 2052	Fundamentals of Electrical Engineering I	3		ECE 2054	Fundamentals of Electrical Engineering II	3
ECE 2053	Fundamentals of Electrical Engineering I Lab	1		ECE 2055	Fundamentals of Electrical Engineering II Lab	1
ECE 2409	Fundamentals of MATLAB	2		ECE 2042	Fundamentals of Computer Engineering I	3
ECE 2900	Intro to Electrical and Computer Engineering	1		ECE 2043	Fundamentals of Computer Engineering I Lab I	1
MAT 2705	Differential Equations with Linear Algebra	4		ECE 3720	Engineering Probability and Statistics	3
PHY 2402	Physics II, Electricity & Magnetism	3		MAT 2500	Calculus III	4
PHY 2403	Physics Lab for Engineering	1			Humanities: THL _≥ 2000	3

Junior Year						
First Semester		Credits		Second Semester		Credits
ECE 3220	Signal Processing	4		ECE 3450	Digital Electronics	3
ECE 3500	Electronic Materials and Devices	4		ECE 3690	Engineering Electromagnetics	4
ECE 3550	Analog Electronics	4		ECE 3770	Electrical Communications	4
ECE 3900	Professional Development Seminar	2		ECE 3970	Design Seminar - EE	2
	Science, Technical or Mathematics Elective	3		ECE 4290	Engineering System Models and Control	4

Senior Year						
First Semester		Credits		Second Semester		Credits
ECE 4970	Design Project - EE	3		ECE 4972	Design Project Report - EE	1
	EE Track Elective*	3			EE Track Elective*	3
	Professional Electives***	6			Professional Electives***	6
	Ethics Elective**	3			Humanities Elective from THL, PHI, ETH, PJ, EGR 2001	3
					Free Elective	3

*Track Electives chosen from one of the following tracks: Signal Processing Systems, High Frequency Systems, Embedded Systems, Electronic Systems, Power Systems, or General Electrical Engineering. See Approved Lists of Courses of EE Tracks.

**Ethics-based Elective chosen from ECE Departmental list of approved courses.

***Professional Electives, preapproved by student's Academic Adviser, for the pursuit of minors, concentrations, and other academic plans.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Mechanical Engineers are concerned with applying the principles of solid mechanics, fluid mechanics, thermodynamics, heat transfer, material science, dynamics and control to the analysis and design of machines and systems of all types. In applying this technical knowledge, the mechanical engineer must consider economic constraints and the social and ecological implications of solutions imposed. The mechanical

engineering curriculum offers the student an opportunity to pursue educational objectives within the framework of this broad theme.

Mission Statement The department is committed to provide a strong educational experience in the discipline of mechanical engineering, which at the same time, is sufficiently broad to prepare the students adequately for the societal and professional aspects of their careers. Students will be educated to be professionally competent and socially responsible.

Program Educational Objective

Our graduates will:

- be valued members of their organizations because of their skills and abilities as mechanical engineers;
- solve complex technical problems and/or design systems that are useful to society by applying the fundamental scientific principles that underpin the mechanical engineering profession;
- apply their knowledge and skills to successfully practice professions other than mechanical engineering if they desire;
- advance in their chosen career paths by utilizing their technical, communication, interpersonal, and leadership skills;
- demonstrate the desire for enhancing their personal and professional growth by making progress toward, or successfully completing an advanced degree, and/or professional development courses, and/or engineering certification;
- be actively engaged in service to their profession and their communities, consistent with the tradition of St. Augustine.

The first two years of the mechanical engineering program are devoted to laying a foundation of mathematics, physical science, and the general engineering sciences. The junior and senior years are devoted primarily to mechanical engineering topics. The required courses span the field of mechanical engineering, and career/ME electives provide the opportunity to pursue specific areas of the discipline in greater depth. The student chooses three courses (9 credit hours) of technical electives plus an additional three credits of a career/free elective. The design process is emphasized throughout the program and culminates with a senior year project that requires a synthesis of basic principles learned in previous courses.

All mechanical engineering students are required to take at least two of the elective courses offered by the department, designated as the ME elective in the program of studies. Ordinarily students will take three or more such courses, designated career/ME electives and one other course, designated the career/free elective, which can be any three credit course. However, the career/ME and the career/free elective slots may be applied to a minor or concentration in Liberal Arts & Sciences or to a minor in Business. The specific courses must be selected in conjunction with the appropriate departmental office and the student's academic adviser. Requirements for a minor are set by the appropriate department. All concentrations and minors must be approved by the Chair of Mechanical Engineering. Any course which meets a mechanical engineering curriculum requirement and also a requirement for a concentration or minor may be counted for both.

Throughout the curriculum the technical courses are balanced by a careful selection of humanities courses to ensure that the effects of technology on society are given due consideration in design.

A faculty adviser is assigned to each student at the beginning of his/her freshman year to provide academic and career guidance for the remainder of the student's years in the program until graduation. The adviser should be consulted regarding such topics as career electives, minors or concentrations, graduate studies, undergraduate research, and completion of degree requirements for graduation.

Program of Studies

Sophomore Year						
First Semester		Credits		Second Semester		Credits
MAT 2500	Calculus III	4		CEE 2103	Mechanics of Solids	3
ME 2100	Statics	3		COM 1101	Business and Professional Communication	3
ME 2502	Professional Development Seminar	1		MAT 2705	Differential Equations with Linear Algebra	4
ME 2505	ME Analysis & Design	4		ME 2101	Dynamic Systems I	3
PHY 2402	Physics II: Electricity and Magnetism	3		ME 2900	ME Lab I	1
PHY 2403	Physics Lab for Engineering	1		ME 3100	Thermodynamics I	3

Junior Year						
First Semester		Credits		Second Semester		Credits
ECE 2052	Fund of Electrical Egr	3		ME 3300	Material Science	3
ECE 2053	Fund. of Electrical Egr Lab	1		ME 3333	Manufacturing Engineering	3
ME 3102	Dynamic Systems II	3		ME 3900	ME Lab II	1
ME 3402	Solid Mechanics and Design I	3			ME Restricted Elective ¹	3
ME 3600	Fluids and Fluid Systems	3			Humanities: THL \geq 2000	3
ME 3950	Heat Transfer	3			Social Science/ Humanities Elective ²	3

Senior Year						
First Semester		Credits		Second Semester		Credits
ME 4801	Design Seminar I	2		ME 4802	Design Seminar in Mechanical Engineering III	2
ME 4902	ME Lab III	1			ME Elective/ Track Elective ³	3
	ME Elective/ Track Elective ³	3			Career/ME Elective ⁴	3
	Career/ME Elective ⁴	3			Professional Development Elective ⁶	3
	THL \geq 2000/PHI elective	3			Free/Career Elective ⁷	3
ETH 2050	Eth Trad & Contemp Life ⁵	3				

¹ Must be selected from ME 3103, ME 3403, ME 4850; a student in a track must take the appropriate course in the track.

² Course selection available from catalog or adviser.

³ Must be selected from the ME electives listed for the students in tracks; any ME elective for others.

⁴ a) an ME elective, or b) appropriate elective from 'hard' sciences and/or other engineering departments, or c) a course from the student's minor.

⁵ This course may be replaced with an approved ethics course from the student's minor.

⁶ List (subject to change): EGR 2001, ME 4050, ME 4600, CEE 4601, BL 1090.

⁷ Any 3-credit course offered at Villanova including a course from student's minor or ME 4010 (summer internship).

SPECIAL PROGRAMS

DUAL DEGREE PROGRAMS, MINORS AND OPTIONS

The College of Engineering provides the flexibility for its students to pursue various program additions and options. These include a dual degree program leading to a Bachelor of Arts degree, or a Bachelor's degree through the Villanova School of Business; a dual degree program leading to a Bachelor of Science in Computer Engineering and a Bachelor of Science in Electrical Engineering; academic minors in Business, Chemistry, Computer Engineering, Computer Science, Mathematics, Mechatronics, and Physics; the Honors Program; and the ROTC Programs. Also the College of Engineering offers a Five-Year Combined Bachelors/Masters Program in all programs.

DUAL DEGREE PROGRAM LEADING TO A BACHELOR OF SCIENCE IN COMPUTER ENGINEERING AND A BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Superior students may earn both the Bachelor of Science in Computer Engineering and the Bachelor of Science in Electrical Engineering degrees. The two degrees are awarded simultaneously upon completion of all requirements for both degrees. Because of the significant overlap between the two programs, it is possible to earn both degrees in four and a half years. Interested students should consult the ECE Special Programs Adviser as early in their undergraduate studies as possible to obtain additional information.

BACHELOR OF ARTS - DUAL DEGREE PROGRAM

Engineering students wishing to enter a Dual Degree Program must write a letter to the Dean of Engineering requesting admission into the program.

BIOENGINEERING MINOR

Villanova offers a minor in Bioengineering that bridges the Colleges of Engineering, Liberal Arts and Sciences, and Nursing and that provides an opportunity for an interdisciplinary experience for students in engineering, the sciences, and nursing. The minor will be completed by students taking a minimum of 12 credits of science or bioengineering courses outside of the major, a minimum of 9 credits of science or bioengineering courses inside the major (these satisfy the student's major and so do not add course load), and 3 credits from either inside or outside of the major (student's choice). A course in ethics is also required but this adds no additional course load since a course in ethics is already required of all engineering students.

The details of the requirements can be obtained by talking to an academic advisor, or from the site <http://www.villanova.edu/engineering/academics/undergrad/minors/bio/>.

COMPUTER ENGINEERING MINOR

The department offers a minor in computer engineering to students outside the major. The requirements include five required courses and two electives. The required courses are:

- ECE 1620: Engineering Programming and Applications
- ECE 2042 & 2043: Fundamentals of Computer Engineering I & Lab
- ECE 2044 & 2045: Fundamentals of Computer Engineering II & Lab
- ECE 2052 & 2053: Fundamentals of Electrical Engineering I & Lab
- ECE 3445: Computer Architecture (prerequisites ECE 2042 & 2043)

The two electives must be selected from the following list.

- ECE 5240: Multimedia
- ECE 5430: Microcomputer System Design (prerequisites ECE 2042 & 2043)
- ECE 5444: Introduction to Fuzzy Logic (prerequisite ECE 2409)
- ECE 5445: Introduction to Neural Networks (prerequisite ECE 2409)
- ECE 5450: Microcontrollers and Applications (prerequisites ECE2042 & 2043)
- ECE 5470: Topics in Computer Networks
- ECE 5477: Computer Communications Security
- ECE 5484: Advanced Digital System Design (prerequisite ECE 3450)
- ECE 5540: Digital Integrated Electronics (prerequisite ECE 3450)
- ECE 5790: Digital Signal Processing (prerequisite ECE 3220 or ECE 3240)
- ECE 5792: Real-Time Digital Signal Processing (prerequisite ECE 5790)

Prerequisite courses must be satisfied.

ELECTRICAL ENGINEERING MINOR

The department offers a minor in electrical engineering to science and engineering students outside the major. The requirements include six required courses and two electives.

Required Courses:

- ECE 2052 and ECE 2053 (lab): Fundamentals of Electrical Engineering I
- ECE 2054 and ECE 2055 (lab): Fundamentals of Electrical Engineering II
- ECE 2409: Fundamentals of MATLAB
- ECE 3690: Engineering Electromagnetics

One of the remaining courses must be chosen from the following two courses:

- ECE 3220: Signal Processing
- ECE 3240: Discrete-Time Signals & System

One of the remaining courses must be chose from the following two courses:

- ECE 3500: Electronic Materials & Devices
- ECE 3550: Analog Electronics

ENGINEERING ENTREPRENEURSHIP MINOR

The objective of the Engineering Entrepreneurship minor is to develop creative students who recognize opportunities; design innovative products and services to capitalize on the opportunities; and understand how to take action to make them a reality, either by creating an independent venture, or working within an existing company. The minor is limited to engineering students. The required courses are:

- EGEN 2100: Creativity and Innovation
- EGEN 2200: Engineering Entrepreneurship I

EGEN 2300: Sophomore Practicum
EGEN 3100: Engineering Entrepreneurship II
EGEN 3300: Junior Entrepreneurship Practicum I
EGEN 3200: Engineering Entrepreneurship III
EGEN 3300: Junior Entrepreneurship Practicum II
EGEN 4200: Engineering Entrepreneurship IV

MECHATRONICS MINOR

The purpose of the mechatronics minor is to provide interested undergraduate Mechanical Engineering and Electrical and Computer Engineering students an opportunity to undertake interdisciplinary courses of relevance to state-of-the-art electromechanical system applications. The requirements of the minor according to major are the following. ME and ECE elective courses can be replaced by an approved list of graduate courses.

Mechanical Engineering Majors

Required ME Courses:

ME 2100: Statics
ME 3150: Introduction to Dynamics
ME 4102: System Dynamics

Required ECE Courses:

ECE 2042 and ECE 2043 (lab): Fundamentals of Computer Engineering I
ECE 2052 and ECE 2053 (lab): Fundamentals of Electrical Engineering I
ECE 2054 Fundamentals of Electrical Engineering II

One of the remaining courses must be chosen from the following ME electives:

ME 5411: Mechatronics
ME 5421: Robotics
ME 5203: Automatic Control
ME or EGR graduate course from the list below

One of the remaining courses must be chosen from the following ECE electives:

ECE 3550: Analog Electronics
ECE 4290: Engineering System Models and Controls
ECE 5450: Microcontrollers
ECE 5800: Electric Machines
ECE or EGR graduate course from the list below

Graduate courses accepted for Mechatronics Minor:

ME 7204 - Comp-Aided Anal Multibody Sys
ME 7205 - Advanced Dynamics
ME 8204 - Robotics: Analysis & Control
ME 8402 - Control Systems Engineering
EGR 8302 - Digital Control
EGR 8303 - Optimal & Model Pred Control
ECE 7500 - Fund Solid State Electronics
ECE 8320 - Control Systems Engineering
ECE 8340 - Real-time Control & Robotics
ECE 8342 - Digital Control Systems
ECE 8425 - Microproc & Microcomp
ECE 7550 - Linear Integrated Electronics
ECE 8800 - Electric Machinery

ECE 8810 - Power System Modeling

Electrical and Computer Engineering Majors

Required ME Courses:

ME 2100: Statics

ME 3150: Introduction to Dynamics

ME 4102: System Dynamics

Required ECE Courses:

ECE 2052 and ECE 2053 (lab): Fundamentals of Electrical Engineering I

ECE 2054 and ECE 2055 (lab): Fundamentals of Electrical Engineering II

ECE 2042 and ECE 2043 (lab): Fundamentals of Computer Engineering I

One of the following courses must be chosen from the following ME electives:

ME 5411: Mechatronics

ME 5421: Robotics

ME 5203: Introduction to Automatic Control

One of the remaining courses must be chosen from the following ECE electives:

ECE 5390: Control System Design

ECE 5450: Microcontrollers

ECE 5800: Electric Machines

FIVE-YEAR COMBINED BACHELORS/MASTERS PROGRAMS

In many fields of engineering the Master's degree is rapidly becoming the entry level requirement for engineering graduates seeking employment. The College of Engineering offers the opportunity to those students who wish to obtain a Bachelor's and a Master's degree in five years. This program is academically demanding and requires a recommendation from the student's undergraduate program adviser.

Requirements vary among the programs. Students interested in the Combined Bachelors/Masters Program should consult their program of interest.

MINORS OUTSIDE THE COLLEGE OF ENGINEERING

Students should contact the Dean's Office in the respective college regarding the specific program.

ACADEMIC POLICIES & GENERAL INFORMATION

Unless otherwise noted, the College of Engineering follows the general university academic policies and regulations listed in the University section of this Catalog. It is the responsibility of the student to know and comply with all academic policies and regulations of the University and of the College of Engineering. Such policies may change without prior notice. Policies specific to the College of Engineering follow:

ACADEMIC STANDING

In order to remain in good academic standing, undergraduate engineering students must maintain a cumulative Grade Point Average (GPA) of at least 2.00 and a cumulative Technical Grade Point Average (TGPA) of at least 2.00. Technical courses are defined as all engineering, science, and mathematics courses.

Academic Standing Review: Students who receive a grade of D, D-, F, N or Y, or whose overall or semester GPA or TGPA falls below the requirements stated above, will be reviewed by the Academic Standing Committee. This review takes place at the end of each semester when grades are deemed final by the Registrar's Office.

Students who receive grades of D, D-, F or Y, but who have a GPA and TGPA of at least 2.00, will receive a letter of concern, mailed to the permanent address on file with the University.

Students with a semester GPA or TGPA below the required minimums stated above will receive a letter of poor performance. These students will be instructed to meet with their academic adviser to plan for ways to improve their future performance.

Academic Probation: Students with a GPA or TGPA below the required minimums stated above, may be placed on Academic Probation and will be notified by an official letter from the Dean's Office. While on academic probation, the student is ineligible to participate in any extracurricular activities. Normally, a student is not permitted to be on probation for more than one semester.

Dismissal from the College: A student may be asked to transfer out of the College of Engineering. A letter informing the students will be sent by courier. This letter will contain instructions for the student as well as deadline dates for actions that the student must take.

Repeat Freshman Year: The Academic Standing Committee may allow a freshman student to declare academic bankruptcy and repeat the semester or the year with a new start on the cumulative average (though a record of the year's work will remain on the transcript.)

ADVANCED PLACEMENT CREDIT

Information on advanced placement credit is found at:

www.villanova.edu/engineering/resources/policies/index.htm?page=coursecredit.htm

ADVISING

During the freshman year a student is encouraged to learn more about the engineering profession in order to make a more informed choice of a major field of study. Assistance necessary to arrive at this decision (which is made prior to pre-registration for sophomore year) is provided by the College of Engineering in the following ways:

As a freshman, a student is assigned to a faculty adviser, who provides career planning advisement and when appropriate, referrals. In addition, the College of Engineering sponsors programs that inform freshman students about career opportunities available in each major field of engineering. Finally, all freshmen are required to take EGR 1200 Interdisciplinary Projects I and EGR 1205 Interdisciplinary Projects II. These courses provide both an overview and hands-on experience in all fields of engineering offered by the College.

Academic advisement for freshmen and upper class engineering students is provided by the student's faculty adviser.

AUDIT

A student may elect to audit a course to reinforce and strengthen his/her current knowledge or to explore new areas without the pressure of tests and grades. No academic credit is earned for auditing a course; however, the audited course is noted on the student's official record. Permission to audit a course must be obtained from the student's adviser.

AWARDS AND HONORS

Dean's List: A student who has earned a semester GPA of 3.50 or above; is a full-time student; has completed 12 or more credits in the semester; and has no N or unreported grades is placed on the Dean's List. Approximately two months after the end of the semester, an appropriate letter of acknowledgement is sent to the student at the permanent address on file with the University.

Dean's Award for Academic Achievement: This award was established to recognize the outstanding academic performance of undergraduate engineering students. To be eligible an undergraduate student must be a senior, majoring in engineering, with a cumulative grade point average of at least 3.50 at the end of the Fall term, who will graduate within the current academic year.

Dean's Award for Meritorious Service: This award was established to recognize exceptional service to the College of Engineering by undergraduate engineering students. To be eligible nominees must be senior engineering students who are involved in extra-curricular and/or service activities within the College for a sustained period. Preference is given to students who demonstrate noteworthy leadership in one or more activities.

National Honorary Engineering Societies: In order to recognize and encourage excellence in scholarship, chapters of the following national honorary engineering societies are maintained by the college: Tau Beta Pi, for all engineers; Chi Epsilon, for Civil Engineers; Eta Kappa Nu, for Electrical Engineers and Computer Engineers; and Pi Tau Sigma, for Mechanical Engineers.

COMPUTING

College and University Computing. The entire campus is linked via a high-speed network and is connected to the internet. The College has multiple computer labs reserved for use exclusively by engineering students. Access to the workstations in these labs is provided 24 hours a day, 7 days a week, with proper authorization of the student's Wildcard. The College also provides Terminal Services which allows students to run Engineering software remotely. Students are issued wireless laptop computers as part of their curricula. New computers are issued every two years. Support of the program is provided by UNIT, the University's IT group, with a walk-in, on-line, and telephone help desk system.

Departmental Computing. There are more than 100 microcomputer workstations located in engineering classrooms, laboratories, and the four engineering departments.

The Chemical Engineering Department makes available a number of personal computers for student use in carrying out classroom assignments. It has also dedicated several personal computers to data acquisition and control in laboratory experiments. Chemical Engineering students utilize two computer laboratories to run packaged software for simulation of process systems, including AspenTech's ASPEN-PLUS. The departmental computer laboratories also provide a wide range of special-purpose software prepared by the department faculty in the sciences of material and energy balances, thermodynamics, process control, fluid flow and heat/mass transfer.

The Civil and Environmental Engineering Department utilizes a variety of industry specific software in its classes. Examples include AUTOCAD, MATLAB, STAAD, PCA BEAM, PCA COL, HEC-RAS, HEC-HMS, HCS, SIM Traffic and others. These packages are available through the college laptop program and computer labs. Student exposure to computer based applications includes spreadsheet and economic analysis, structural design and analysis of buildings and bridges, slope stability, stream water quality modeling and waste load allocations, sensitivity and matrix analysis of civil engineering systems, watershed hydrology and river hydraulics, and transportation system planning and simulation of traffic systems. The department maintains computers in its laboratories to support senior level projects undergraduate research.

The Electrical and Computer Engineering Department utilizes Sun file servers with Sun workstations, which are available in the Advanced Computer Systems Laboratory. In addition the department has PC's, CAE workstations and Microcontroller Development Systems. The department software includes UNIX, SMP, ILS, HP ECE Design Center software, VHDL CAD Tools, MATLAB, SIMULINK, Electronics Workbench, and PSpice. This software is used for digital signal processing, real-time control and robotics, microwave measurement, and the design of analog and digital circuits and systems.

The Mechanical Engineering Department has personal computers that are equipped with data acquisition systems and software for graphing, designing, and calculating. Software includes MATLAB, FLUENT, Mathcad, ANSYS, AUTOCAD, PCDEFORMTM, ADAMS, Working Model 3DTM and other applications programs used for finite element analysis, heat transfer and fluid flow, and multi-body dynamic analysis.

INTERNATIONAL STUDIES

The College of Engineering, recognizing the continued changes globally in both the learning and practicing of the skills of engineering, encourages all majors to consider studying in an overseas university some time during their four years at Villanova. By enhancing language and communication skills, in addition to taking courses in engineering where appropriate, Villanova Engineers will strengthen their own liberal arts program so integral to a Villanova Engineering degree.

For more information contact your Department Chair or the International Studies Office, Middleton Hall, 2nd floor.

The University policy on International Studies states, in part:

“If a student enrolls in a course that is not listed on his/her Prior Approval Form, he/she must obtain the appropriate department chair's approval via email prior to continuing in the class.”

The College strongly emphasizes this policy. Accordingly, it will not accept credits for any course taken abroad that is not pre-approved and listed on the student's Prior Approval Form.

LABORATORY FACILITIES

Dedication of the Center for Engineering Education and Research (CEER) took place in June 1998. The multi-million dollar facility provides leading edge technological support for teaching and research in the College of Engineering.

The 88,400-square-foot structure houses 30 instructional and research laboratories, a computer-aided engineering center, an interdisciplinary student projects laboratory, student group study rooms, a multi-media lecture hall seating 140, and conference rooms.

The Chemical Engineering Department maintains modern laboratory facilities to support the Bachelor of Science in Chemical Engineering curriculum. Experiments in the two Chemical Engineering Laboratory courses range from the demonstration of fundamental principles in bench-scale or pilot plant equipment, to hands-on experience with fully integrated, industrial scale process equipment. In addition, the department maintains extensive general-purpose laboratory capabilities for those students who carry out an experimental investigation as part of their senior Senior Research project.

The Civil and Environmental Engineering Department is committed to “hands-on” education in its experimental, computational, and design laboratories. Facilities are currently dedicated to instruction and research capabilities in materials (soils, concrete, and steel), the environment, geology, structures, measurements, fluid mechanics and hydraulics. The department’s newest facility, the Structural Engineering Teaching and Research Lab, opened in May 2005. The building provides 5,000 sq ft of useable floor space to test full-scale structural members up to 90 feet in length. The building includes two smaller laboratories for testing construction materials under various environmental conditions. The facility supports undergraduate instruction as well as both undergraduate and graduate research.

The Electrical and Computer Engineering Department laboratory facilities are available to serve as important components of study in specialized areas as well as for core studies. Laboratories are currently in place for instruction and research in Control Systems, Digital Systems and Microprocessors, Electronics, Signal Processing, Intelligent Systems, Solid State Devices, Microwaves, Microcontrollers, Advanced Electronics, Advanced Computer Systems, Antenna Anechoic Chamber, Antenna Research, Communications, and Student Projects.

The Mechanical Engineering Department laboratories provide an environment for students to reinforce their understanding of the fundamental principles of mechanical engineering and apply that knowledge in experimental analysis and problem-solving. Laboratories currently available include Manufacturing Processes, Thermodynamics, Engine Testing, Materials Testing and Material Science, Control, Vibration, Stress, Heat Transfer, Fluid Mechanics, and Wind Tunnel.

RESOLUTION OF ACADEMIC PROBLEMS

Problems of an academic nature are best resolved by the student meeting directly with the professor with whom the student has the problem. If the problem cannot be adequately resolved in this manner, the department chair should be consulted. In nearly all cases, matters are resolved at this level or lower. In special cases, the Associate Dean for Academic Affairs can be consulted to attempt to draw the process to closure.

In all cases it is imperative that the student, not the student’s parents or guardians, deal with the matter. At Villanova, part of the education of all students is learning to constructively deal with conflicts and the formulation and execution of solutions to these conflicts in a rational way. Clearly, this can happen only if the student is intimately

involved in the process.

STUDENT ORGANIZATIONS

In order to encourage close contact between our engineering students and practicing professional engineers, and to assist students in establishing their engineering identity, the College of Engineering maintains student chapters of many engineering professional societies. These groups, with the cooperation and support of the faculty and practicing professional engineers, organize and sponsor meetings, guest speakers, and field trips of interest to engineering students.

Refer to the website: www.villanova.edu/engineering/organizations/ for information on student organizations.

The broader professional and social interests of all engineering students are served by the Villanova University Engineering Student Council. Membership in this organization is open to all undergraduate engineering students.

REGISTRATION POLICIES

REGISTRATION

Qualified undergraduate engineering students are permitted and encouraged to enroll in more challenging courses than those specified in their standard curriculum, provided that they obtain approval from their Department Chair and other appropriate individuals where necessary, as indicated below.

Required and elective courses in the humanities and social sciences may be taken through the Honors Program for those students who qualify. Application should be made directly to the Director of the Honors Program.

Undergraduate students wishing to enroll in an engineering graduate course must have written approval from their Department Chair and the chair of the department offering the course. Permission will normally be granted only to seniors who have a cumulative Grade Point Average of 3.0 or higher. Permission to enroll in graduate courses offered by other Colleges within the University must be obtained from the Dean of that College as well as the chair of the department offering the course and the student's Department Chair.

COURSE DROP/ADD

A student may drop and/or add courses during the first week of a semester without incurring academic penalty or affecting the student's official transcript. After the drop/add period, a student must seek departmental approval for dropping or adding courses. A student may drop/add on-line but only with an approval code from his/her academic adviser and only during the drop/add period.

COURSE OVERLOADS

The individual engineering majors are comprised of appropriately sequenced course groupings referred to as "regular semester course loads." Students enrolled may take up to four credits, or one course, overload in any given semester provided that:

1. a freshman has permission from the office of the Associate Dean of Academic Affairs. Normally, only second semester freshmen with a GPA of at least 3.5 are permitted to overload, or
2. an upperclassman has approval from his adviser and chair. Normally a GPA of at least 3.0 is required in this case.

MINORS

Minors may be pursued in the College of Engineering. For further information on minors, please review the Special Programs section above or consult <http://www.engineering.villanova.edu/academics/undergrad/minors/>

PRE-MATRICULATED CREDIT

College-level work completed prior to high school graduation may be awarded transfer credits upon receipt of the following:

1. an official letter from the high school principal, guidance counselor or other educational professional describing the college-level program of study;
2. an official letter from the college/university stating that the courses were taught by members of the regular faculty, open to enrollment by and graded in competition with regularly matriculated undergraduates at the college, and a regular part of the normal curriculum published in the college catalog; and
3. an official, seal-bearing transcript from the college/university showing a grade of C or better.

Courses taught at the high school and courses taught in a distance learning format will not be accepted.

Each supporting document is to be sent to the Dean of Engineering.

SATISFACTORY/UNSATISFACTORY GRADE POLICY

Upperclass engineering students may elect to take, on a Satisfactory/Unsatisfactory basis, one course per semester which meets all of the following criteria: 1) it is not specifically designated by course number in the curriculum of the student's major; 2) it is not being given by the department in which the student is majoring; 3) it is not designated as a Technical Elective in the curriculum of the student's major; and 4) permission to take the course has been specifically granted by the chair of the department in which the student is majoring.

To take a course on a Satisfactory/Unsatisfactory basis, the student must first register for the course by the normal procedure. After registration has been completed, the student must complete a Satisfactory/Unsatisfactory form (supplied by the Registrar's Office); this form must be signed by the student's Department Chair.

Other pertinent information can be found under the "Grading System" policies in the University section of this Catalog.

TECHNICAL ELECTIVES

Technical Electives for upper class students differ by department. Please visit the individual departmental web sites for more information.

TRANSFER OF CREDIT

With recommendation of their Department Chair, and approval of the Dean of Engineering, active engineering students are permitted to earn course credit at other schools. In order to initiate a request to do this, the student must obtain and complete a Course Elsewhere Form, available in the Office of the Dean of Engineering. A complete description of the substitute course content in the form of a copy of the other institution's official course catalog or a copy of the other institution's web description must be attached to this form. The student should allow 7-10 days for final action to be taken on the request. After that time, the student making the request should contact the office of the Dean of Engineering to determine the outcome.

Students who have completed approved courses elsewhere must request that institution to forward a transcript to their Department Chair. NOTE: only courses in which a grade of "C" (or the equivalent) or better is received will be transferred for credit. Grades of courses taken elsewhere are not included in the calculation of the Grade Point Average (GPA) or Technical Grade Point Average (TGPA) at Villanova University.

It is the University policy that Villanova normally will not pre-approve courses, or transfer credits back to Villanova, for students who will be on a University leave of absence when they enroll in such courses.

It is also the University policy that Villanova will not pre-approve courses to be taken at another University after a student has been dismissed or has withdrawn. If these students apply for readmission to the University, courses taken at other colleges and universities will be evaluated for transfer credit by the Dean of the college to which the student is seeking readmission. Acceptance of any such credits is at the sole discretion of the Dean.

For college-level work done prior to high school graduation, see the Pre-Matriculated College Credit policy in the University Section of this catalog.

WITHDRAWAL FROM COURSES

Engineering student requests for authorized withdrawal from a course without penalty (WX) will be granted automatically until approximately three and a half weeks after mid-term break (view the Academic Calendar for official date).

During this period the following approvals are required for a course withdrawal:

1. If a student is requesting to withdraw from one course, only the approval of the academic adviser is needed.
2. If an upper-class student is requesting to withdraw from more than two or more courses, the approval of the academic adviser and department chairman is needed because of the larger impact on the student's program, including the possibility of dropping into part-time student status.
3. If a freshman engineering student is requesting to withdraw from two or more courses, the approval of the academic adviser and the associate dean is needed because of the impact on the student's program and the need for the student to consider college course-elsewhere rules.

After that date, course withdrawal will be authorized only under exceptional circumstances such as serious personal or medical problems for which the student must provide evidence. The Associate Dean of Academic Affairs will decide whether or not to grant the requests based on the information supplied by the student.

Course withdrawals may delay a student's planned graduation date, so students should discuss the implications with their advisers.

WITHDRAWAL FROM THE UNIVERSITY

Official withdrawal from Villanova University itself must be authorized by the dean of the student's college. A student must submit a formal letter (or the appropriate college form) to the dean and participate in an interview. The letter of withdrawal may be countersigned and/or submitted by the student's parents or legal guardian. Applications for withdrawal usually must be submitted by the end of the fourth academic week.

DEPARTMENTS

Chemical Engineering

Chair: Dr. Randy Weinstein
Office: 217 White Hall, tel. 610-519-4950
Website: www.villanova.edu/engineering/departments/chemical/
Courses: www.villanova.edu/engineering/departments/chemical/undergrad/catalog.htm

Civil and Environmental Engineering

Chair: Dr. Ronald A. Chadderton
Office: 139 Tolentine Hall, tel. 610-519-4960
Website: www.villanova.edu/engineering/departments/civil/
Courses: www.villanova.edu/engineering/departments/civil/undergrad/catalog.htm

Electrical and Computer Engineering

Chair: Dr. Pritpal Singh
Office: 411 Tolentine Hall, tel. 610-519-4970
Website: www.villanova.edu/engineering/departments/electrical/
Courses: www.villanova.edu/engineering/departments/electrical/undergrad/catalog.htm

Mechanical Engineering

Chair: Dr. C. Nataraj
Office: 131 Tolentine Hall, tel. 610-519-4980
Website: www.villanova.edu/engineering/departments/mechanical/
Courses: www.villanova.edu/engineering/departments/mechanical/undergrad/catalog.htm