

The Department of Engineering

Chemical Engineering, B.S.

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About

- Bachelor of Science in Chemical Engineering
- Bachelor of Science in Chemical Engineering, Honors.

The chemical engineer typically uses the principles of mathematics, chemistry, biology, physics and engineering sciences to creatively solve technical and commercial problems arising in the design and operation of industrial scale processes. These solutions must respond to economic constraints and address social, ethical, environmental and safety implications. Industrial scale processes can include fuels, bulk chemicals, polymers, foods and pharmaceuticals (including protein, gene and cell-based therapies). Graduates are prepared to think critically and apply their skills in chemical and biological engineering to fields such as sustainability, entrepreneurship, manufacturing, research and development, finance, management and patent law.

Mission Statement

The Chemical and Biological Engineering Department is committed to providing undergraduate and graduate students innovative and effective educational experiences that will prepare them for the technological, professional, and societal challenges of their careers. Through research that advances engineering and scientific knowledge, the department inspires students and brings value to the university and broader community.

Program Educational Objectives

Consistent with the University's Augustinian Mission that values broadly-educated, and well-rounded individuals, graduates of the Chemical Engineering Program are able to pursue the following career objectives:

- Conduct themselves in a manner that recognizes their professional responsibilities to society in areas such as sustainability, safety, ethics, and environmental protection.
- Apply the underlying scientific principles and technical capabilities needed to succeed in both the traditional and emerging fields of the chemical engineering profession.
- Continue to learn and grow by leveraging professional opportunities that facilitate the effective practice of their chosen profession.

Curricular Philosophy

The early years of the chemical engineering curriculum includes a strong humanities component while emphasizing the basic principles of natural and engineering sciences. Later courses relate these skills to chemical engineering applications including the solution of open-ended problems constrained by requirements such as economics, safety, and sustainability. Courses develop students' abilities with the complexity of design experiences systematically increasing throughout the courses in chemical and biological engineering; culminating in the senior process design and process controls courses.

The curriculum includes several engineering, science, and humanities/social science electives, providing flexibility for a student to pursue individual educational and career goals. Chemical and biological engineering electives include opportunities for specialization in traditional and emerging fields of chemical engineering as well as biochemical and biological engineering. Seniors may conduct research for academic credit or complete a six-month co-op. Students develop their academic plan with guidance from a faculty member designated as the student's academic advisor.

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
CHE 1102	Material Balances	3
MAT 1505	Calculus II	4
PHY 2400	Physics I Mechanics	3
CHM 1104	General Chemistry Lab II	1
CHM 1152	General Chemistry II	4
EGR 1002	Career Compass IB	0.5

Sophomore Year

First Semester

Course	Title	Credits
MAT 2705	Diff Equation with Linear Alg	4
CHE 2101	Thermodynamics 1	3
CHE 2201	Fluid Dynamics	3
CHE 2301	ChE Computational Methods	3
CHM 2201	Organic Chemistry Lab I	1
CHM 2211	Organic Chemistry I	3
EGR 2003	Career Compass IIA	0.5

Second Semester

Course	Title	Credits
CHE 2102	Thermodynamics 2	3
CHE 2202	Heat Transfer	3
CHE 2402	Technical Communications	3
CHM 2202	Organic Chemistry Lab II	1
CHM 2212	Organic Chemistry II	3
	Elective - Humanities/Social Sci	3
EGR 2004	Career Compass IIB	0.5

Junior Year

First Semester

Course	Title	Credits
CHE 3201	Mass Transfer	3
CHE 3202	Reactor Design	3
CHE 3401	Unit Operations Lab 1	3
	Elective - CBE	3
	Elective - Science	3
	Elective - Humanities/Social Sci	3
EGR 3005	Career Compass IIIA	0.5

Second Semester

Course	Title	Credits
CHE 3301	ChE Applied Mathematics	3
CHE 3402	Unit Operations Lab 2	3
CHM 3402	Physical Chem Lab II	1
CHM 3416	Physical Chem for Engineers	3
	Elective - Ethics (for Chemical Engineering)	3
	Elective - CBE	3
EGR 3006	Career Compass IIIB	0.5

Senior Year

First Semester

Course	Title	Credits
CHE 4201	Process Design	3
	Elective - CBE	3
	Elective - CBE	3
	Elective - Science	3

Second Semester

Course	Title	Credits
CHE 4202	Process Controls	3
	Elective - THL (2000 or above)	3
	Elective - THL/PHI	3
	Elective - CBE	3
	Elective - Free	3

Academic Requirements

Students must earn a minimum grade of C- in all required CHE (Chemical Engineering) courses to satisfy the degree requirements.

These courses include the following:

[CHE 1102 Material Balances](#)

[CHE 2101 Thermodynamics 1](#)

[CHE 2102 Thermodynamics 2](#)

[CHE 2201 Fluid Dynamics](#)

[CHE 2202 Heat Transfer](#)

[CHE 2301 ChE Computational Methods](#)

[CHE 2402 Technical Communications](#)

[CHE 3201 Mass Transfer](#)

[CHE 3202 Reactor Design](#)

[CHE 3301 ChE Applied Mathematics](#)

[CHE 3401 Unit Operations Lab 1](#)

[CHE 3402 CHE Unit Operations Lab 2](#)

[CHE 4201 Process Design](#)

[CHE 4202 Process Controls](#)

A student earning a grade of D+, D, or D- in a required CHE course must retake that course and earn a minimum grade of C- to satisfy the degree requirement.

If an approved equivalent course is taken at another institution, a minimum grade of C is required to transfer the credits to Villanova. Students requesting to take a course elsewhere should complete the appropriate form which can be found on the [Current Engineering Undergraduate Students Intranet site](#).

A student earning a grade of F in a required CHE course that is a prerequisite for a subsequent required CHE course may not enroll in the subsequent course until the prerequisite requirement is satisfied.

For CBE Elective courses or courses offered by other departments, a minimum passing grade of D- is sufficient for the course to satisfy a degree requirement.