

# The Department of Engineering

## Biochemical Engineering Minor

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### About:

A branch of chemical engineering, Biochemical Engineering serves primarily the biopharmaceutical industry, which is responsible for the manufacture of antibiotics, vaccines, antibodies and most recently, cell therapy products. Villanova's minor in Biochemical Engineering will prepare graduates to make an immediate impact designing and optimizing biopharmaceutical processes and products.

With high average annual salaries and strong job growth rate, and Villanova's proximity to more than 1,200 pharmaceutical companies in the Philadelphia region, a minor in this rapidly evolving field is an excellent choice!

This minor is open to Engineering students and Chemistry, Biology, or Biochemistry Majors with a GPA greater than 3.0. Students outside the Department of Chemical and Biological Engineering should contact the Minor Director during preregistration to discuss course enrollment.

Students may pursue only one of the following: Biochemical, Biomedical, or Cellular Engineering minors.

### Requirements:

The Biochemical Engineering minor requires a total of seven courses (a minimum of 21 credits), three of which are Engineering Electives, three Science Electives, and one Ethics course. The selected courses must include two laboratory experiences, which can be satisfied by a science laboratory course (a laboratory course, or a 4 credit science course with an integrated laboratory) or an Engineering Elective with an integrated laboratory (CHE 5535 or approved topics in CHE 4831).

No AP credit may fulfill any requirements for the minor. A minimum of five courses must be taken at Villanova for completion of the minor.

## Engineering Electives:

[CHE 5332 - Special Topics](#): Certain topics can be counted with consultation of the Minor Director.

[CHE 4831 - Senior Project Studio I](#): Certain topics can be counted with consultation of the Minor Director.

Electives are subject to change and may be added to this list at the discretion of the College of Engineering. A student may request prior approval of an elective not currently on the list.

### Select three courses from the list below:

Course	Title	Credits
CHE 5133	Brewing Science & Tech	3
CHE 5530	Gene Therapy Methods & Research	3
CHE 5532	Intro to Biotechnology	3
CHE 5533	Bioseparations	3
CHE 5534	Biomaterials	3
CHE 5535	Bioengineering Lab Techniques	3
CHE 5536	Biochemical Data Analysis	3
CHE 5540	Cellular Engineering	3
EGR 2021	Elements of Biomed Engr	3

## Science Electives:

Electives are subject to change and may be added to this list at the discretion of the College of Engineering. A student may request prior approval of an elective not currently on the list.

### Select three courses from the list below:

Course	Title	Credits
BIO 2105	General Biology I	4
BIO 3351	Genetics	4
BIO 3591	General Microbiology Lecture	3
BIO 3595	General Microbiology	4
BIO 4105	Medical Microbiology	4
BIO 4205	Cell Biology	4
BIO 4355	Experimental Genetics	4
BIO 4505	Molecular Biology	4
CHM 2212	Organic Chemistry II	3
CHM 3417	Biophysical Chemistry	3
CHM 3514	Bioanalytical Chemistry	3
CHM 4611	Survey of Biochemistry	3
CHM 4222	Organic Struct Analysis	3
CHM 4621	Biochemistry I: Structure	3
CHM 4622	Biochemistry II: Metabolism	3
CHM 4623	Biochemistry III	3
CHM 4652	Biochemical Basis of Disease	3
CHM 4664	Signal Transduction	3
CHM 4665	Enzymes	3
EGR 2020	Physiology for Engineers	3

## Ethics:

The ethics requirement for the minor can also be met using any course (3-credit minimum) that satisfies an ethics elective requirement in the curriculum of the student's major.

<b>Course</b>	<b>Title</b>	<b>Credits</b>
PHI 4125	Bioethics	3
PHI 2115	Ethics for Health Care Prof	3

## Science Laboratory Experience:

Courses with integrated laboratory

[CHE 4831 - Senior Project Studio I](#): Certain topics can be counted with consultation of the Minor Director.

<b>Course</b>	<b>Title</b>	<b>Credits</b>
BIO 2105	General Biology I	4
BIO 3595	General Microbiology	4
BIO 4105	Medical Microbiology	4
BIO 4205	Cell Biology	4
BIO 4355	Experimental Genetics	4
BIO 4505	Molecular Biology	4
CHE 4831	Senior Project Studio I	3
CHE 5535	Bioengineering Lab Techniques	3

## Science Laboratory Courses:

1-credit laboratory

<b>Course</b>	<b>Title</b>	<b>Credits</b>
CHM 2202	Organic Chemistry Lab II	1
CHM 3503	Bioanalytical Chem Lab	1
CHM 4601	Survey Biochemistry Lab	1
CHM 4603	Biochem Tech. and Pract.	1