

# The Department of Engineering

## Cellular Engineering Minor

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### About:

The genetic engineering of cells has created several innovations, including new therapies for cancer and other genetic disorders, crops with improved properties, and microbes that can perform a variety of useful functions. Villanova's minor in Cellular Engineering will give students the knowledge they need to understand how cells work and the skills they need to manipulate those cellular processes for a wide variety of applications.

This minor is open to Engineering and Arts and Sciences students. Students may pursue only one of the following: Biochemical, Biomedical, or Cellular Engineering minors.

### Requirements:

The minor requires the successful completion of 7 courses (21 credits), including a Capstone course (CHE 5540 or CHE 8591), an Ethics course (PHI 2115), and 5 Electives.

- Students must take at least 1 course in each of the 3 Elective areas: Genetics, Cell Culture, and Cell Biology.
- At least 2 courses must have a lab experience or 1-2 credit lab
- Independent research credits may be substituted for 1 course with a lab experience (e.g., CHE 4831 or 4832, CHM 4801 or 4802) if approved by the Cellular Engineering committee.
- At least 3 courses in total must be from the College of Engineering
- At least 2 courses must be from the Biology or Chemistry Departments

### Capstone:

Course	Title	Credits
	CHE 5540 or CHE 8591	3

## Ethics Course:

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

## Genetics Electives:

Courses with a lab experience or 1-2 credit lab include: CHE 5530 and CHM 4604.

**Select at least one course from the list below:**

<b>Course</b>	<b>Title</b>	<b>Credits</b>
BIO 3351	Genetics	4
CHE 5530	Gene Therapy Methods & Research	3
CHM 4604	Biochem Tech. and Pract II	1
CHM 4621	Biochemistry I: Structure	3

## Cell Culture Electives:

Courses with a lab experience or 1-2 credit lab include: BIO 3595, BIO 4655, BIO 7321, and CHE 5535.

BIO 7321/7322 (Graduate-level Immunology lecture/lab) can be taken in place of BIO 4655.

**Select at least one course from the list below:**

<b>Course</b>	<b>Title</b>	<b>Credits</b>
BIO 3591	General Microbiology Lecture	3
BIO 3595	General Microbiology	4
BIO 4105	Medical Microbiology	4
BIO 4655	Immunology	4
CHE 5532	Intro to Biotechnology	3
CHE 5534	Biomaterials	3
CHE 5535	Bioengineering Lab Techniques	3

## Cell Biology Electives:

Courses with a lab experience or 1-2 credit lab include: BIO 4205 and BIO 4505.

"Topics" in Biology courses (example: BIO 4950) will only count for the minor if they are approved by the Cellular Engineering Minor Director. Previously offered Topics courses that are approved for the Cellular Engineering minor include: Cell Signaling, Cellular Communication, Biology & Biochemistry of RNA, and Parasitology.

### Select at least one course from the list below:

<b>Course</b>	<b>Title</b>	<b>Credits</b>
BIO 4201	Cell Biology Lecture	3
BIO 4205	Cell Biology	4
BIO 4501	Molecular Biology Lecture	3
BIO 4505	Molecular Biology	4
BIO 4950	Advanced Topics in Biology	3
CHE 5536	Biochemical Data Analysis	3
CHM 4622	Biochemistry II:Metabolism	3
EGR 2020	Physiology for Engineers	3