Chemical Engineering, B.S.

Chemical and Biological Engineering Chair: Dr. Christopher Kitchens
Office: 217 White Hall
Telephone: 610-519-5498
Email: chris.kitchens@villanova.edu

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.

**Program:** Engineering  
**Type:** Bachelor of Science

### Freshman Year

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS 1000</td>
<td>Ancients</td>
<td>3</td>
</tr>
<tr>
<td>THL 1000</td>
<td>Faith, Reason, and Culture</td>
<td>3</td>
</tr>
<tr>
<td>MAT 1500</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>CHM 1103</td>
<td>General Chemistry Lab I</td>
<td>1</td>
</tr>
<tr>
<td>CHM 1151</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>EGR 1200</td>
<td>Egr. Interdisciplinary Proj. I</td>
<td>3</td>
</tr>
<tr>
<td>EGR 1001</td>
<td>Career Compass First Yr A</td>
<td>0.5</td>
</tr>
</tbody>
</table>

#### Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS 1001</td>
<td>Moderns</td>
<td>3</td>
</tr>
<tr>
<td>CHE 1102</td>
<td>Material Balances</td>
<td>3</td>
</tr>
<tr>
<td>MAT 1505</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHY 2400</td>
<td>Physics I Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CHM 1104</td>
<td>General Chemistry Lab II</td>
<td>1</td>
</tr>
<tr>
<td>CHM 1152</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>EGR 1002</td>
<td>Career Compass First Yr B</td>
<td>0.5</td>
</tr>
</tbody>
</table>

### Sophomore Year

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 2705</td>
<td>Diff Equation with Linear Alg</td>
<td>4</td>
</tr>
<tr>
<td>CHE 2101</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>CHE 2201</td>
<td>Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHE 2301</td>
<td>ChE Computational Methods</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2201</td>
<td>Organic Chemistry Lab I</td>
<td>1</td>
</tr>
<tr>
<td>CHM 2211</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>EGR 2003</td>
<td>Career Compass Second Yr A</td>
<td>0.5</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
<td>Credits</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>CHE 2102</td>
<td>Thermodynamics 2</td>
<td>3</td>
</tr>
<tr>
<td>CHE 2202</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>CHE 2402</td>
<td>Technical Communications</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2202</td>
<td>Organic Chemistry Lab II</td>
<td>1</td>
</tr>
<tr>
<td>CHM 2212</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - Humanities/Social Sci</td>
<td>3</td>
</tr>
<tr>
<td>EGR 2004</td>
<td>Career Compass Second Yr B</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Junior Year**

**First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 3201</td>
<td>Mass Transfer</td>
<td>3</td>
</tr>
<tr>
<td>CHE 3202</td>
<td>Reactor Design</td>
<td>3</td>
</tr>
<tr>
<td>CHE 3401</td>
<td>Unit Operations Lab 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - CBE</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - Humanities/Social Sci</td>
<td>3</td>
</tr>
<tr>
<td>EGR 3005</td>
<td>Career Compass Third Yr A</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 3301</td>
<td>ChE Applied Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>CHE 3402</td>
<td>Unit Operations Lab 2</td>
<td>3</td>
</tr>
<tr>
<td>CHM 3402</td>
<td>Physical Chem Lab II</td>
<td>1</td>
</tr>
<tr>
<td>CHM 3416</td>
<td>Physical Chem for Engineers</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - Ethics (for Chemical Engineering)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - CBE</td>
<td>3</td>
</tr>
<tr>
<td>EGR 3006</td>
<td>Career Compass Third Yr B</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Senior Year**

**First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 4201</td>
<td>Process Design</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - CBE</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - CBE</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - Science</td>
<td>3</td>
</tr>
</tbody>
</table>

**Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 4202</td>
<td>Process Controls</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - THL (2000 or above)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - THL/PHI</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - CBE</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - Free</td>
<td>3</td>
</tr>
</tbody>
</table>
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.

Category Descriptions

Elective - Humanities/Social Sci

Credits: 3
Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

Select one humanities or social science elective from the list below:

**Humanities**

- Arab & Islamic Studies
- Art History
- Classical Studies
- Communications
- Ethics
- English (excluding internship courses)
- Global Interdisciplinary Studies
- History
- Honors Program (eligible students only)
- Humanities
- Modern Languages (except speaking courses in native language)
- Philosophy
- Theatre
- Theology (2000 and above or course section with core theology attribute)

**Social Sciences**

- Criminology
- Economics
- Geography and the Environment (courses with Core Social Science or Sustainability-Humanities STEM attribute)
- Humanities: HUM designated PSC
- Peace and Justice
- Political Science
- Public Administration
- Psychology
- Sociology
- Gender and Women's Studies

**Elective - CBE**

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

- AP credit cannot satisfy a CBE Elective.
- CBE Electives are typically only available to Juniors and Seniors.
- Students must take both Senior Project Studio courses if selected.
- Seniors must have special permission to take ChemE Graduate Courses (CHE ≥ 7000).
  - Students requesting permission to take a graduate level course should complete the appropriate form which can be found in the [Current Engineering Undergraduate Students Intranet site](#).
- Any graduate level course counted towards a B.S. degree cannot also be counted towards an M.S. degree.
• 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.
• Electives are available based upon instructor availability and student demand.

Advanced Chemical Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 5032</td>
<td>Equipment Design &amp; Spec.</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5062</td>
<td>Chemical Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5132</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5232</td>
<td>Industrial Catalytic Processes</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5332</td>
<td>Special Topics in CHE</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5842</td>
<td>Safety Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Biological Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 5133</td>
<td>Brewing Science &amp; Tech</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5530</td>
<td>Gene Therapy Methods &amp; Research</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5532</td>
<td>Intro to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5533</td>
<td>Bioseparations</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5534</td>
<td>Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5535</td>
<td>Bioengineering Lab Techniques</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5536</td>
<td>Biochemical Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5540</td>
<td>Cellular Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Advanced Materials Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 5534</td>
<td>Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5632</td>
<td>Polymer Sci and Engr</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5633</td>
<td>Nanomaterials &amp; Surface Scienc</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5634</td>
<td>Intro to Material Science</td>
<td>3</td>
</tr>
</tbody>
</table>

Industry Sponsored Research/Design

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 4831</td>
<td>Senior Project Studio I</td>
<td>3</td>
</tr>
<tr>
<td>CHE 4832</td>
<td>Senior Project Studio II</td>
<td>3</td>
</tr>
<tr>
<td>CHE 6000</td>
<td>CBE Co-Op</td>
<td>6</td>
</tr>
</tbody>
</table>
# Sustainable Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 5001</td>
<td>Industrial Liq &amp; Sld Waste</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5002</td>
<td>Prin of Air Pol Control</td>
<td>3</td>
</tr>
<tr>
<td>CHE 5715</td>
<td>Alternative Energy</td>
<td>3</td>
</tr>
</tbody>
</table>

## Other Approved Technical Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 1051</td>
<td>Algorithms &amp; Data Struc I</td>
<td>4</td>
</tr>
<tr>
<td>EGR 2021</td>
<td>Elements of Biomed Engr</td>
<td>3</td>
</tr>
<tr>
<td>NS 2100</td>
<td>Naval Ships Systems I</td>
<td>3</td>
</tr>
<tr>
<td>SUSE 2111</td>
<td>Sus Eng: LCA &amp; Circular Econ</td>
<td>3</td>
</tr>
</tbody>
</table>

## Elective - Science

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

- Science elective options should be discussed with a student’s academic advisor.
- A student may request that a science course not on the approved list be reviewed and considered as a special exception for a science elective.
- Pre-requisites for science courses must be met, and the CBE Department cannot guarantee admission to a course offered by another department.
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 2105</td>
<td>General Biology I</td>
<td>4</td>
</tr>
<tr>
<td>BIO 2106</td>
<td>General Biology II</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3055</td>
<td>Human Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3105</td>
<td>Biostatistics &amp; Exp Design</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3155</td>
<td>Comparative Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3225</td>
<td>Imaging Technology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3255</td>
<td>Evolutionary Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3351</td>
<td>Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3455</td>
<td>Histology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3485</td>
<td>Marine Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3591</td>
<td>General Microbiology Lecture</td>
<td>3</td>
</tr>
<tr>
<td>BIO 3595</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 3661</td>
<td>Environment and Human Health</td>
<td>3</td>
</tr>
<tr>
<td>BIO 3905</td>
<td>Vascular Plants</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4105</td>
<td>Medical Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4205</td>
<td>Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4251</td>
<td>Endocrine Physiol/Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4285</td>
<td>Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4305</td>
<td>Evolution</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4331</td>
<td>Biology of Cancer</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4355</td>
<td>Experimental Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4505</td>
<td>Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 4605</td>
<td>Neurobiology</td>
<td>4</td>
</tr>
<tr>
<td>CHM 3311</td>
<td>Inorganic Chem II</td>
<td>3</td>
</tr>
<tr>
<td>CHM 3417</td>
<td>Biophysical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHM 3511</td>
<td>Instrumental Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHM 3514</td>
<td>Bioanalytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4292</td>
<td>Advanced Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4315</td>
<td>Organometallics</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4331</td>
<td>Bioinorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4611</td>
<td>Survey of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4621</td>
<td>Biochemistry I: Structure</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4622</td>
<td>Biochemistry II:Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4623</td>
<td>Biochemistry III</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4633</td>
<td>Biochemical Parasitology</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4641</td>
<td>Chemical &amp; Biochemical Imaging</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4652</td>
<td>Biochemical Basis of Disease</td>
<td>3</td>
</tr>
<tr>
<td>CHM 4664</td>
<td>Signal Transduction</td>
<td>3</td>
</tr>
<tr>
<td>PHY 2402</td>
<td>Physics II Elec &amp; Magnet</td>
<td>3</td>
</tr>
<tr>
<td>PHY 2416</td>
<td>Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHY 3310</td>
<td>Electronics</td>
<td>3</td>
</tr>
<tr>
<td>EGR 2020</td>
<td>Physiology for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>GEV 1053</td>
<td>Environmental Studies II</td>
<td>3</td>
</tr>
<tr>
<td>GEV 2310</td>
<td>Environmental Chemistry</td>
<td>4</td>
</tr>
</tbody>
</table>

**Elective - Ethics (for Chemical Engineering)**

Credits: 3
Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETH 2050</td>
<td>The Good Life: Ethics &amp; Cont Prob</td>
<td>3</td>
</tr>
<tr>
<td>NS 4200</td>
<td>Leadership and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2115</td>
<td>Ethics for Health Care Prof</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2121</td>
<td>Environmental Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2130</td>
<td>Business Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2155</td>
<td>Engineering Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2160</td>
<td>The Ethics of War</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2170</td>
<td>Mass Media Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2180</td>
<td>Computer Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 2550</td>
<td>Technology &amp; Society</td>
<td>3</td>
</tr>
<tr>
<td>PHI 4125</td>
<td>Bioethics</td>
<td>3</td>
</tr>
<tr>
<td>PJ 2900</td>
<td>Ethical Issues in P &amp; J</td>
<td>3</td>
</tr>
<tr>
<td>PJ 5400</td>
<td>Ethics, Justice and the Family</td>
<td>3</td>
</tr>
<tr>
<td>THL 4100</td>
<td>THM Catholic Ethics</td>
<td>3</td>
</tr>
<tr>
<td>THL 4200</td>
<td>Ethics of Life and Death</td>
<td>3</td>
</tr>
<tr>
<td>THL 4330</td>
<td>Christian Environmental Ethics</td>
<td>3</td>
</tr>
<tr>
<td>VSB 2007</td>
<td>Corp Respon &amp; Regulation</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective - THL (2000 or above)**

Credits: 3

Theology (THL) course or course with CTHL (Core Theology) attribute, at the 2000 level or above.

**Elective - THL/PHI**

Credits: 3

Electives are subject to change. Electives may be added to this list at the discretion of the College of Engineering.

One 3-credit course from:

- Theology (THL) course or course with CTHL (Core Theology) attribute, at the 2000 level or above
- Philosophy (PHI)
- Peace and Justice (PJ)
- [ETH 2050](#) - The Good Life: Ethics & Cont Prob
- [EGR 2930](#) - Catholic Social Teaching for EGRs
- Any Humanities or Social Science course with a PJ (Peace and Justice) attribute

**Elective - Free**

Credits: 3

Any Villanova three credit course or Villanova courses that when combined add up to three credits (for example, three 1-credit Honors courses)