# BBE - Bioproducts Engineering

## Freshman Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBE 1001 BBE Orientation</td>
<td>BBE 1002 Biorenewable Resources</td>
</tr>
<tr>
<td>Chem 1061/65 Chem Princ I (placement into course or 1015)</td>
<td>Chem 1062/66 Chem Princ II (1061/1065)</td>
</tr>
<tr>
<td>Math 1371 or 1271 Calculus I (placement into course or pre-reg)</td>
<td>Math 1372 or 1272 Calculus II (1371)</td>
</tr>
<tr>
<td>Phys 1301W Intro Physics I &amp; (Math 1371)</td>
<td>Phys 1302W Intro Physics II (1301, &amp;Math 1372)</td>
</tr>
<tr>
<td>CSE 1001: 1st Yr Experience</td>
<td>3/4</td>
</tr>
<tr>
<td>Liberal Education course or Writ 1301</td>
<td>3/4</td>
</tr>
</tbody>
</table>

## Sophomore Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 1009 General Biology</td>
<td>Chem 2301 Organic Chemistry I (1062/66)</td>
</tr>
<tr>
<td>Chem 4501 Intro to Thermo (1062/66, &amp;Math 2374, Phys 1302)</td>
<td>BBE 3043 Bio/Environ Thermo (Chem 1065/65, Phys 1302W, Math 1372 or 1372)</td>
</tr>
<tr>
<td>BBE 2002 Intro to Eng Design (Math 1271, Chem 1061/65, Writ 1301)</td>
<td>Liberal Education course</td>
</tr>
</tbody>
</table>

## Junior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBE 3013 Engr Prin Cell Proc (Biol 1009, Math 1372, BioC 2011 or Chem 2301)</td>
<td>BBE 4013 Transport in Biol Sys (UD, BBE 3031, 3043, 3012)</td>
</tr>
<tr>
<td>BBE 4001 Chem. of Biomass (Chem 2301)</td>
<td>BBE 4713 Biol Process Engr (UD CSE, BBE 3031, 4013 or &amp;4013)</td>
</tr>
<tr>
<td>Liberal Education course</td>
<td>BBE 4402 BP Engineering Lab I (UD, Chem 2301)</td>
</tr>
<tr>
<td>Stat 3021 Intro to Prob/Stat (Math 1372)</td>
<td>3/4</td>
</tr>
</tbody>
</table>

## Senior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBE 4401 BP Prod Engineering (UD, BBE 3012, 3033, 3043, 4015)</td>
<td>BBE 4502W Capstone Design (UD, BBE 2002)</td>
</tr>
<tr>
<td>BBE 4403 BP Engr Lab II (UD, Chem 2301)</td>
<td>Liberal Education course</td>
</tr>
<tr>
<td>BBE 4023W Proc Cont. &amp; Instru (UD)</td>
<td>Technical Elective III</td>
</tr>
<tr>
<td>Technical Elective I</td>
<td>Liberal Education course</td>
</tr>
<tr>
<td>Technical Elective II</td>
<td>3/4</td>
</tr>
</tbody>
</table>

## About This Plan

- This plan is not a contract. Curriculum can change.
- Shaded courses are only offered in the indicated semester.
- Course pre-requisites and co-requisites (designated by &) are listed below the course number and title. Upper division (UD) requires admission to the major prior to enrollment.
- Students can take either the CSE-only or University-wide versions of the math course (Math 1371/1271, 1372/1272, 2373/2243, 2374/2263).
- Double boxed courses, along with one of two courses with a dashed outline, are required for application to this major.
- Chemical Principles labs (1065/1066) must be taken concurrently with the lectures (1061/1062).
- Liberal Education and Writing requirements with an (*) will be fulfilled by taking courses required for this major at UM-TC.

## Applying to your Major

Students who have completed the required courses for admission to this major and have a 3.2 UM-TC technical GPA at the end of the fall semester will be guaranteed admission. All other students who have completed the required courses will be considered for admission on a space-available basis. Admission following the spring semester is only based on space availability. The major application database is available at z.umn.edu/csemajorapp.

## Department Contact Information

- Website: www.bbe.umn.edu
- Main Phone: 612-625-5200
- Main Office: 203 Kaufert Lab & 213 BioAgEng Bldg (St Paul)
- Director of Undergraduate Studies: Professor Ulrike Tschirner
- Email: tschi007@umn.edu

## University Degree Requirements

All students must complete the following Writing & Liberal Education requirements, as noted on their APAS report. See link for full Core & Theme names: z.umn.edu/liberaleducation

### Writing Requirements:
- University Writing: Writ 1301/1401 or equivalent
- Writing Intensive (WI):
  - Two: 1xx or 2xx level
  - One: 3/4/5xxx level (in major)*
  - One: 3/4/5xxx level (any dept.)*

### Liberal Education

<table>
<thead>
<tr>
<th>CORES</th>
<th>THEMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio*</td>
<td>Civ</td>
</tr>
<tr>
<td>Phy*</td>
<td>DSJ</td>
</tr>
<tr>
<td>SocS</td>
<td>Env*</td>
</tr>
<tr>
<td>Ltr</td>
<td>GP</td>
</tr>
<tr>
<td>AH</td>
<td>TS*</td>
</tr>
</tbody>
</table>

| Total Credits Needed for Degree: 125 |
What can I do with a major in bioproducts and biosystems engineering?

Bioproducts and biosystems engineers apply their knowledge of engineering, technology, chemistry, and biology to select the appropriate renewable resources such as wood, agricultural residues, fiber crops and other biomass to produce a wide range of “green” materials, including wood products, paper, chemicals, industrial feedstocks, plastics, building materials, and energy.

Bioproducts and biosystems engineers also develop energy efficient, economical, and environmentally friendly processes, machinery and equipment for manufacturing these products. They consider the ethical and safety issues surrounding bioproducts as well as their economic impact, and design sustainable systems that protect the environment, humans, plants, and animals.

In addition to basic science and engineering, bioproducts and biosystems engineers focus on bioresources, biological/biochemical processes, bio-based products and biological systems.

- Environmental and ecological engineers focus on engineering applications to land and water resources, air and soil quality, land-use management, ecosystem services, ecological restoration, and waste management.
- Bioproducts engineers design and develop engineering solutions for sustainable manufacturing and end-use applications of “green” products including biofuels, bioenergy, biodegradable plastics, building materials, paper and chemicals.
- Food engineers design and develop systems for production, processing, distributing, and storing food and agricultural materials.

**Employers (sample listing)**

- Andersen Windows
- Appvion
- Avant Energy
- Barr Engineering
- Cargill
- General Mills
- Genetech, Inc.
- Hormel
- Institute for Environmental Health
- Land O’Lakes Inc.
- Medtronic
- Metropolitan Council
- MEDITOX Laboratories
- MN Pollution Control Agency
- MOM Brands
- Monsanto Company
- POET
- SSOE Group
- Soil & Water Conservation District
- Syngenta
- Tetra Pak
- USDA
- Verso Paper
- Virent Energy Systems

**Industries (sample listing)**

- Alternative Energy
- Law
- Pulp and paper products
- Research
- Building products/materials
- Ecology/environmental research
- Public health
- Wood products
- Marketing
- Manufacturing
- Renewable plastics
- Laboratories
- Institutes
- Food processing
- Food safety and security
- Environmental consulting
- Consultants
- Quality control
- Government agencies
- Alternative energy
- University laboratories
- Agriculture
- Renewable plastics
- Ecological restoration

**Positions (sample listing)**

**Environmental Engineer:** Addresses environmental and natural resource challenges that affect air, soil, and water quality.

**Bioproducting/Food Engineer:** Integrates biology and engineering to design sustainable systems that produce high quality food, renewable energy, and biomaterials for consumers while protecting the environment.

**Bioproducts Engineer:** Develops sustainable biomass conversion solutions to meet the world’s growing materials and energy demand.

**Environmental Consultant:** Offers expert advice to local, state, and federal government agencies and private sector clients who need to adopt environmentally sound practices or clean up contaminated sites.

**Alternative Energy Specialist:** Designs and installs systems that use renewable energy sources.

**Process Engineer:** Develops a series of actions that efficiently and economically develop products such as plastics, chemicals, fuel, and pharmaceuticals.

**Product Engineer:** Plans and develops the tools, processes, machines, and equipment necessary to produce or manufacture products.

**Research Engineer:** Conducts systematic investigations leading to new knowledge for a specific application that influences the design and construction of prototypes.

**Project Engineer:** Leads a group of technical engineers and serves as the contact person to the client.

*Examples from: The Eco Guide to Careers that Make a Difference and Great Jobs for Engineering Majors*

*Some positions may require an advanced degree*