### Geoengineering

#### Freshman Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
</table>
| Math 1371 Calculus I  
(placement into course or pre-req) | Math 1372 Calculus II  
(1371) |
| Phys 1301W Intro Physics I  
(&Math 1371) | Phys 1302W Intro Physics II  
(1301, &Math 1372) |
| Chem 1065 Chem Princ I Lab  
(&1061) | Chem 1066 Chem Princ I Lab  
(1061/65, &1062) |
| Chem 1061 Chem Princ I  
(placement into course or 1015, &1065) | Chem 1062 Chem Princ II  
(1061/65, &1066) |
| CSE 1001 1st Yr Experience | Liberal Education course or  
Writ 1301 (recommend Biol 1001 or 1009) |
| Liberal Education course or  
Writ 1301 | 3/4 |

#### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</thead>
</table>
| Math 2374 Multivariable Calc  
(1372) | Math 2373 Lin Alg/Diff Eq  
(1372) |
| AEM 2011 Statics  
(CSE, Phys 1301, &Math 2374) | ESci 2201 Solid Earth Dyn  
(CSE, Phys 1301, Math 1372) |
| ESci 2301 Mineralogy  
(&Chem 1061/65, &Math 1371) | ESci 3891 Field Methods |
| Liberal Education course | Liberal Education course |

#### Junior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</thead>
</table>
| ESci 4501 Structural Geology  
(2201) | ESci 2302 Petrology or  
(2301) |
| CEGE 3501 Environ Enggr  
(Chem 1062/66, Phys 1302) | ESci 2203 Earth Surface Dyn  
(CSE, 2011, &Math 2373) |
| AEM 2012 Dynamics  
(CSE, 2011, &Math 2373) | CEGE 4121 Comp Apps II  
(UD, 3101, Math 2373, Math 2374) |
| CEGE 3301 Soil Mechanics I  
(CSE, 3301, AEM 3031) | CEGE 3102 Uncert & Dec Analysis |
| CEGE Technical Elective | CEGE 3502 Fluid Mechanics  
(CSE, 3101, AEM 2012 or 3031, Math 2373) |
| Liberal Education course | CEGE 3103 Ethics & Prof Pract+  
(UD) |
| Technical Elective | Technical Elective I |

**About This Plan**

- This plan is not a contract. Curriculum can change. The APAS is the official method for tracking completion of University degree requirements. Prior to fall 2015, CEGE courses were listed with CE or GeoE course designators.
- 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).
- AEM 2021 can substitute for AEM 2011; students must then take an alternative course for AEM 2012 (chose from: EE 2001, MatS 2001, CSci 1113, ME 3331, Chem 2301).

**Applying to your Major**

Students who have completed the required courses for admission to this major (indicated with double boxes on plan) 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.

**Total Credits Needed for Degree:** 125

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### Department Contact Information

- **Website:** cese.umn.edu
- **Undergraduate Handbook:** z.umn.edu/cegeundergradhandbook
- **Main Phone:** 612-625-5522
- **Main Office:** 122 Civil Engineering Building
- **Director of Undergraduate Studies:** Dr. Randal Barnes
- **Email:** barne003@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: 1xxx or 2xxx level
  - One: 3/4/5xxx level (in major)*
  - One: 3/4/5xxx level (any dept.)*

Requirements with an (*) will be fulfilled by taking courses at UM-TC required for this major.

#### Liberal Education

<table>
<thead>
<tr>
<th>CORES:</th>
<th>THEMES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio</td>
<td>4 of 5:</td>
</tr>
<tr>
<td>Phy*</td>
<td>Civ</td>
</tr>
<tr>
<td>Hist</td>
<td>DSJ</td>
</tr>
<tr>
<td>SocS</td>
<td>Env*</td>
</tr>
<tr>
<td>Lit</td>
<td>GP</td>
</tr>
<tr>
<td>AH</td>
<td>TP</td>
</tr>
<tr>
<td>Mth*</td>
<td></td>
</tr>
</tbody>
</table>

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**Rev. 5/2017**
What can I do with a major in...

Geoengineering

ACTIVITIES GEOENGINEERING MAJORS DO:

Geological engineering is the application of the earth sciences to human problems that relate to the earth and earth systems. It is a broad, interdisciplinary field with many specialty areas such as: geotechnical site investigation for a variety of projects, rock and soil slope stability, environmental site characterization and planning, hydrogeology, groundwater studies and engineering, natural and manmade hazard investigations, and exploration and development of fossil fuel and mineral deposits. Geological engineers carry out site investigations for dams, plants, roads, railways, housing projects, mines, quarries, pipelines, petroleum production, forestry operations, and more. They interact with civil engineers to design essential parts of projects. They are responsible for environmental assessments or clean-up activities where pollution has occurred. They prospect for minerals, building material resources and drinking water. They carry out hazard and risk assessments and mapping for landslides and earthquakes. Geological engineers solve engineering problems and design engineering systems with, on, and in geological materials, while at the same time protecting the environment. For example, they learn how to evaluate a site on which a tunnel, dam, or road might be built. They learn about geologic hazards, such as earthquakes and volcanoes, and how to best protect people from them. They examine ways to search for and harvest energy resources. They also discover ways to protect the earth while still exploiting it through careful industrial practices.

Some specializations include: geoenvironmental engineering (preserving the environment through managing pollution) and geomechanical engineering (interpreting the geological variables in structural foundations and evaluating of natural geological hazards).

INDUSTRIES GEOENGINEERING MAJORS WORK IN (SAMPLE LISTING):

<table>
<thead>
<tr>
<th>Civil engineering firms</th>
<th>Mining</th>
<th>Research and development</th>
<th>Petroleum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Minerals</td>
<td>Federal government</td>
<td>Hazardous waste</td>
</tr>
<tr>
<td>Consulting</td>
<td>Physiography</td>
<td>City/county municipalities</td>
<td>Environmental</td>
</tr>
</tbody>
</table>

EMPLOYERS WHO HIRE GEOENGINEERING MAJORS (SAMPLE LISTING):

<table>
<thead>
<tr>
<th>Schlumberger</th>
<th>BP</th>
<th>Cities and municipalities</th>
<th>Esri</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Compliance Corporation</td>
<td>Accenture</td>
<td>Epic</td>
<td>U.S. Steel</td>
</tr>
<tr>
<td>WSP Environment and Energy</td>
<td>FM Global</td>
<td>Federal Highway Administration</td>
<td>ExxonMobil</td>
</tr>
<tr>
<td>Monsanto</td>
<td>Minnesota Builders Exchange</td>
<td>Cliffs Natural Resources Inc.</td>
<td>Honeywell</td>
</tr>
<tr>
<td>Alliant Energy</td>
<td>General Electric</td>
<td>Barr Engineering Company</td>
<td>Exponent</td>
</tr>
<tr>
<td>MN Department of Transportation</td>
<td>American Engineering Testing Inc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TYPES OF POSITIONS FOR GEOENGINEERING MAJORS (SAMPLE LISTING):

- **Environmental scientist:** Performs research in water supply issues, conducting assessment of groundwater and surface water supplies, assisting water utilities, and reviewing plans and projects proposed and conducted by the public and private sectors to assist in the development and implementation of water resource management policies.

- **Geomechanical engineers:** Applies the principles of engineering and geology to the study of geological materials, including soil, ground water, and rock foundations.

- **Hydrogeologist:** Conducts a range of field activities, including drilling, monitoring well installation, sampling, and oversight of contractors. Hydrogeologists evaluate and interpret field and sampling data, develop conclusions concerning site conditions based on data analysis, and prepare written plans and reports related to site investigation and remediation activities.

**Some of these positions may require an advanced degree.**