CIVIL ENGINEERING, BS

for the degree of Bachelor of Science in Civil Engineering

department website: Department of Civil & Environmental Engineering [https://cee.illinois.edu]
department faculty: Department of Civil & Environmental Engineering Faculty [https://cee.illinois.edu/directory/faculty]
overview of college admissions & requirements: Engineering [https://engineering.illinois.edu/admissions]
college website: https://engineering.illinois.edu/

Civil engineering is a profession that applies the basic principles of science in conjunction with mathematical and computational tools to solve problems associated with developing and sustaining civilization on our planet. Civil engineering works are generally one-of-a-kind projects; they are often grand in scale; and they usually require cooperation among professionals of many different disciplines. The completion of a civil engineering project involves the solution of technical problems in which uncertainty of information and myriad non-technical factors often play a significant role. Some of the most common examples of civil engineering works include bridges, buildings, dams, airports, highways, tunnels, and water distribution systems. Civil engineers are concerned with flood control, air and water pollution, and the design of facilities to withstand earthquakes and other natural hazards, in addition to protecting our environment for a sustainable future.

The civil engineering program comprises seven areas (construction engineering and management, construction materials engineering, environmental engineering, geotechnical engineering, environmental hydrology and hydraulics, structural engineering, and transportation engineering) and three interdisciplinary programs (sustainable and resilient infrastructure systems; energy, water, and environmental sustainability; and societal risk management). Although each area has its own special body of knowledge and engineering tools, they all rely on the same fundamental core principles. Civil engineering projects often draw expertise from many of these areas and programs.

CEE’s Program Education Objectives are to educate CEE students to:

1. Successfully enter the civil and environmental engineering profession as practicing engineers and consultants with prominent companies and organizations in diverse areas that include structural, transportation, geotechnical, materials, environmental, and hydrologic engineering; construction management; or other related or emerging fields.
2. Pursue graduate education and research at major research universities in civil and environmental engineering, and related fields.
3. Pursue professional licensure.
4. Advance to leadership positions in the profession.
5. Engage in continued learning through professional development.
6. Participate in and contribute to professional societies and community services.

Program Review and Approval

To qualify for the degree of Bachelor of Science in Civil Engineering, each student’s academic program plan must be reviewed by a standing committee of the faculty (the Program Review Committee) and approved by the Associate Head of Civil and Environmental Engineering in charge of undergraduate programs. This review and approval process ensures that individual programs satisfy the educational objectives and all of the requirements of the civil engineering program, that those programs do not abuse the substantial degree of flexibility that is present in the curriculum, and that the career interests of each student are cultivated and served.

for the degree of Bachelor of Science in Civil Engineering

Overview of Curricular Requirements

The curriculum requires 128 hours for graduation and is organized as follows.

Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Code | Title | Hours
--- | --- | ---
CEE 195 | About Civil Engineering | 1
CEE 495 | Professional Practice | 0
ENG 100 | Engineering Orientation | 0

Total Hours | 1

1 External transfer students take ENG 300.

Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Code | Title | Hours
--- | --- | ---
CHEM 102 | General Chemistry I | 3
CHEM 103 | General Chemistry Lab I | 1
CHEM 104 | General Chemistry II | 3
CHEM 105 | General Chemistry Lab II | 1
MATH 221 | Calculus I | 4
MATH 225 | Introductory Matrix Theory | 2
MATH 231 | Calculus II | 3
MATH 241 | Calculus III | 4
MATH 285 | Intro Differential Equations | 3
PHYS 211 | University Physics: Mechanics | 4
PHYS 212 | University Physics: Elec & Mag | 4
PHYS 213 | Univ Physics: Thermal Physics | 2

Total Hours | 34

1 MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

Civil Engineering Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of civil engineering.

Code | Title | Hours
--- | --- | ---
CEE 201 | Systems Engrg & Economics | 3
CEE 202 | Engineering Risk & Uncertainty | 3

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CS 101 Intro Computing: Engrg & Sci 3
SE 101 Engineering Graphics & Design 3
TAM 211 Statics 3
TAM 212 Introductory Dynamics 3
TAM 251 Introductory Solid Mechanics 3
TAM 335 Introductory Fluid Mechanics 4

Total Hours 25

**Science Elective**

This elective allows the student to gain additional depth in science. The course should be selected according to the requirements and recommendations for the selected area of study, which is subject to approval by the faculty Program Review Committee.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATMS 120</td>
<td>Severe and Hazardous Weather</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 321</td>
<td>Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 222</td>
<td>Quantitative Analysis Lecture</td>
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<tr>
<td>CS 357</td>
<td>Numerical Methods I</td>
<td>3</td>
</tr>
<tr>
<td>ECE 205</td>
<td>Electrical and Electronic Circuits</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 107</td>
<td>Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 118</td>
<td>Natural Disasters</td>
<td>3</td>
</tr>
<tr>
<td>ME 200</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 420</td>
<td>Methods of Applied Statistics</td>
<td>3 or 4</td>
</tr>
</tbody>
</table>

**Civil Engineering Technical Electives**

This course work is designed to give each student a broad background in the areas of civil engineering through the core courses and to allow each student to develop a focused program through advanced technical electives in chosen primary and secondary fields. There are seven areas of study which include:

- Construction Engineering and Management
- Construction Materials Engineering
- Environmental Engineering
- Environmental Hydrology and Hydraulic Engineering
- Geotechnical Engineering
- Structural Engineering
- Transportation Engineering

In addition to the areas of study, three interdisciplinary programs can be chosen by students. They include:

- Sustainable and Resilient Infrastructure Systems
- Energy-Water-Environment Sustainability
- Societal Risk Management

The fundamental principles of civil engineering design and the behavior of civil engineering systems are emphasized throughout the course work. The specific choices of courses in this category are made through the submission of the Plan of Study, which is subject to approval by the faculty Program Review Committee.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CEE 300</td>
<td>Behavior of Materials</td>
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</tr>
<tr>
<td>CEE 310</td>
<td>Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 320</td>
<td>Construction Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 330</td>
<td>Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 340</td>
<td>Energy and Global Environment</td>
<td>3</td>
</tr>
<tr>
<td>CEE 350</td>
<td>Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 360</td>
<td>Structural Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 380</td>
<td>Geotechnical Engineering</td>
<td>3</td>
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</table>

**Civil Engineering Core Courses**

The courses that are required and recommended for the primary and secondary fields are listed below. Select at least 5 courses from the following list:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ATMS 120</td>
<td>Severe and Hazardous Weather</td>
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<td>ATMS 303</td>
<td>Synoptic-Dynamic Wea Analysis</td>
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<td>ECE 205</td>
<td>Electrical and Electronic Circuits</td>
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<td>FIN 221</td>
<td>Corporate Finance</td>
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<td>GEOL 107</td>
<td>Physical Geology</td>
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</tr>
<tr>
<td>GEOL 118</td>
<td>Natural Disasters</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 333</td>
<td>Earth Materials and the Env</td>
<td>4</td>
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<tr>
<td>GEOL 380</td>
<td>Environmental Geology</td>
<td>4</td>
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<tr>
<td>ME 200</td>
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<td>3</td>
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<tr>
<td>NPRE 201</td>
<td>Energy Systems</td>
<td>2 or 3</td>
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<tr>
<td>SE 400</td>
<td>Engineering Law</td>
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<tr>
<td>STAT 420</td>
<td>Methods of Applied Statistics</td>
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<tr>
<td>UP 205</td>
<td>Ecology &amp; Environmental Sustainability</td>
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</table>

**Civil Engineering Core Courses Recommended- None**

**Advanced Technical Courses - Required:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>CEE 401</td>
<td>Concrete Materials</td>
<td>4</td>
</tr>
<tr>
<td>CEE 421</td>
<td>Construction Planning</td>
<td>3 or 4</td>
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<tr>
<td>CEE 422</td>
<td>Construction Cost Analysis</td>
<td>3 or 4</td>
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<tr>
<td>CEE 461</td>
<td>Reinforced Concrete I</td>
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**Advanced Technical Courses - Recommended:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>CEE 401</td>
<td>Concrete Materials</td>
<td>4</td>
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<tr>
<td>CEE 424</td>
<td>Sustainable Const Methods</td>
<td>4</td>
</tr>
<tr>
<td>CEE 460</td>
<td>Steel Structures I</td>
<td>3</td>
</tr>
<tr>
<td>CEE 469</td>
<td>Wood Structures</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CEE 480</td>
<td>Foundation Engineering</td>
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**Construction Materials Engineering**

Information listed in this catalog is current as of 08/2019
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tr>
<td>GEOL 107</td>
<td>Physical Geology</td>
<td>4</td>
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<tr>
<td>GEOL 333</td>
<td>Earth Materials and the Env</td>
<td>4</td>
</tr>
<tr>
<td>ME 200</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 430</td>
<td>Failure of Engr Materials</td>
<td>3 or 4</td>
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<tr>
<td>MSE 401</td>
<td>Thermodynamics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 402</td>
<td>Kinetic Processes in Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 420</td>
<td>Ceramic Materials &amp; Properties</td>
<td>3</td>
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<td>MSE 450</td>
<td>Polymer Science &amp; Engineering</td>
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<tr>
<td>TAM 427</td>
<td>Mechanics of Polymers</td>
<td>3</td>
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<tr>
<td>TAM 428</td>
<td>Mechanics of Composites</td>
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<tr>
<td>CEE 300</td>
<td>Behavior of Materials</td>
<td>4</td>
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<tr>
<td>CEE 310</td>
<td>Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 360</td>
<td>Structural Engineering</td>
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<td>CEE 380</td>
<td>Geotechnical Engineering</td>
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<tr>
<td>CEE 401</td>
<td>Concrete Materials</td>
<td>4</td>
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<tr>
<td>CEE 405</td>
<td>Asphalt Materials I</td>
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<tr>
<td>CEE 406</td>
<td>Pavement Design I</td>
<td>3 or 4</td>
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<tr>
<td>CEE 460</td>
<td>Steel Structures I</td>
<td>3</td>
</tr>
<tr>
<td>CEE 461</td>
<td>Reinforced Concrete I</td>
<td>3</td>
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<tr>
<td>CEE 469</td>
<td>Wood Structures</td>
<td>3 or 4</td>
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<tr>
<td>CEE 483</td>
<td>Soil Mechanics and Behavior</td>
<td>4</td>
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<tr>
<td>MSE 406</td>
<td>Thermal-Mech Behavior of Matls</td>
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<td>MSE 440</td>
<td>Mechanical Behavior of Metals</td>
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<tr>
<td>MSE 445</td>
<td>Corrosion of Metals</td>
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<tr>
<td>CEE 300</td>
<td>Behavior of Materials</td>
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<td>CEE 310</td>
<td>Transportation Engineering</td>
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<td>CEE 330</td>
<td>Geotechnical Engineering</td>
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<td>CEE 360</td>
<td>Structural Engineering</td>
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<td>CEE 380</td>
<td>Geotechnical Engineering</td>
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<tr>
<td>CEE 401</td>
<td>Concrete Materials</td>
<td>4</td>
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<tr>
<td>CEE 405</td>
<td>Asphalt Materials I</td>
<td>3 or 4</td>
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<tr>
<td>CEE 406</td>
<td>Pavement Design I</td>
<td>3 or 4</td>
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<td>CEE 460</td>
<td>Steel Structures I</td>
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<tr>
<td>CEE 461</td>
<td>Reinforced Concrete I</td>
<td>3</td>
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<tr>
<td>CEE 469</td>
<td>Wood Structures</td>
<td>3 or 4</td>
</tr>
<tr>
<td>CEE 483</td>
<td>Soil Mechanics and Behavior</td>
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<tr>
<td>CEE 484</td>
<td>Applied Soil Mechanics</td>
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<tr>
<td>CEE 485</td>
<td>Corrosion of Metals</td>
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<tr>
<td>CEE 434</td>
<td>Environmental Systems I</td>
<td>3</td>
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<tr>
<td>CEE 438</td>
<td>Science &amp; Environmental Policy</td>
<td>3</td>
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<tr>
<td>CEE 442</td>
<td>Environmental Engineering Principles, Physical</td>
<td>4</td>
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<tr>
<td>CEE 443</td>
<td>Env Eng Principles, Chemical</td>
<td>4</td>
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<tr>
<td>CEE 444</td>
<td>Env Eng Principles, Biological</td>
<td>4</td>
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<tr>
<td>CEE 445</td>
<td>Air Quality Modeling</td>
<td>4</td>
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<tr>
<td>CEE 447</td>
<td>Atmospheric Chemistry</td>
<td>4</td>
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<tr>
<td>CEE 449</td>
<td>Environmental Engineering Lab</td>
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<tr>
<td>CEE 452</td>
<td>Hydraulic Analysis and Design</td>
<td>3</td>
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<tr>
<td>CEE 453</td>
<td>Urban Hydrology and Hydraulics</td>
<td>4</td>
</tr>
<tr>
<td>CEE 457</td>
<td>Groundwater</td>
<td>3</td>
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**Civil Engineering Core Courses Required:**

- CEE 320
- CEE 330
- CEE 340
- CEE 350
- CEE 360
- CEE 380
- CEE 390
- CEE 401
- CEE 405
- CEE 410
- CEE 420
- CEE 430
- CEE 440
- CEE 450
- CEE 460
- CEE 470
- CEE 480

**Civil Engineering Core Courses Recommended:**

- CEE 310
- CEE 331
- CEE 332
- CEE 341
- CEE 342
- CEE 351
- CEE 361
- CEE 370
- CEE 381
- CEE 391
- CEE 411
- CEE 421
- CEE 431
- CEE 441
- CEE 451
- CEE 461
- CEE 471
- CEE 481

**Advanced Technical Courses Recommended:**

- CEE 401
- CEE 405
- CEE 406
- CEE 460
- CEE 461
- CEE 469
- CEE 483

**Advanced Technical Courses Required:**

- CEE 406
- CEE 460
- CEE 461
- CEE 469
- CEE 483

**Environmental Engineering**

Science Electives Required - None

Science Electives Recommended:

- CHEM 222 Quantitative Analysis Lecture
- CHEM 232 Elementary Organic Chemistry I
- CS 357 Numerical Methods I
- GEOL 107 Physical Geology
- MCB 300 Microbiology
- ME 200 Thermodynamics
- MSE 401 Thermodynamics of Materials
- STAT 420 Methods of Applied Statistics

Civil Engineering Core Courses Required:

- CEE 330 Environmental Engineering
- CEE 350 Water Resources Engineering
- CEE 380 Geotechnical Engineering

Advanced Technical Courses Required - At least one of:

- CEE 437 Water Quality Engineering
- CEE 440 Fate Cleanup Environ Pollutant
- CEE 446 Air Quality Engineering

Advanced Technical Course Recommended:

- CEE 430 Ecological Quality Engineering

**Geotechnical Engineering**

Science Electives Required - None

Science Electives Recommended:

- GEOL 333 Earth Materials and the Env
- GEOL 380 Environmental Geology
- GEOL 401 Geomorphology
- GEOL 411 Structural Geol and Tectonics
- GEOL 440 Sedimentology and Stratigraphy
- GEOL 470 Introduction to Hydrogeology

Civil Engineering Core Courses Required:

- CEE 360 Structural Engineering
- CEE 380 Geotechnical Engineering

Civil Engineering Core Courses Recommended:

- CEE 300 Behavior of Materials
- CEE 310 Transportation Engineering
- CEE 320 Construction Engineering
- CEE 330 Environmental Engineering
- CEE 350 Water Resources Engineering

Advanced Technical Courses Required:

- CEE 360 Structural Engineering
- CEE 380 Geotechnical Engineering

**Structural Engineering**

Science Electives Required - None

Science Electives Recommended:

- CS 357 Numerical Methods I
- ECE 205 Electrical and Electronic Circuits
- GEOL 107 Physical Geology
- GEOL 118 Natural Disasters
- ME 200 Thermodynamics

Civil Engineering Core Courses:

- CEE 300 Behavior of Materials
- CEE 360 Structural Engineering
- CEE 380 Geotechnical Engineering

Civil Engineering Core Courses Recommended:

- CEE 320 Construction Engineering

Advanced Technical Courses Required:

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<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CEE 460</td>
<td>Steel Structures I</td>
<td>3</td>
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<tr>
<td>CEE 461</td>
<td>Reinforced Concrete I</td>
<td>3</td>
</tr>
<tr>
<td>CEE 465</td>
<td>Design of Structural Systems</td>
<td>3</td>
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<tr>
<td>CEE 470</td>
<td>Structural Analysis</td>
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<tr>
<td><strong>Civil Engineering Core Courses Required (Choose one):</strong></td>
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<tr>
<td>CEE 401</td>
<td>Engineering Core Courses Recommended</td>
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<tr>
<td>CEE 405</td>
<td>Charged Solids and Polymers</td>
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<td>CEE 406</td>
<td>Geotechnical Engineering and Energy</td>
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<td>CEE 407</td>
<td>Water Quality Engineering</td>
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<td>CEE 408</td>
<td>Highway Engineering</td>
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<td>Transportation Engineering</td>
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<td>CEE 410</td>
<td>Environmental Fluid Mechanics</td>
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<td>CEE 411</td>
<td>Environmental Systems I</td>
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<tr>
<td>CEE 412</td>
<td>High-Speed Rail Engineering</td>
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<td>CEE 413</td>
<td>Renewable Energy Systems</td>
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<tr>
<td>CEE 414</td>
<td>Sustainable Design Eng Tech (Must also select 3 course from recommended list below)</td>
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<tr>
<td><strong>Advanced Technical Courses Recommended:</strong></td>
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<tr>
<td>CEE 415</td>
<td>Geometric Design of Roads</td>
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<tr>
<td>CEE 416</td>
<td>Traffic Capacity Analysis</td>
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<td>CEE 417</td>
<td>Urban Transportation Planning</td>
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<td>CEE 418</td>
<td>Public Transportation Systems</td>
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<tr>
<td>CEE 419</td>
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<td>CEE 421</td>
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<tr>
<td>CEE 422</td>
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<td>CEE 423</td>
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</tr>
<tr>
<td>CEE 424</td>
<td>Renewable Energy Systems</td>
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</tbody>
</table>

**Transportation Engineering**

Science Electives Required - None

Science Electives Recommended:
- CS 357 Numerical Methods I - 3
- CEE 300 Behavior of Materials - 4
- ME 200 Thermodynamics - 3
- CEE 301 Transportation Engineering - 3
- CEE 302 Construction Engineering - 3
- CEE 330 Environmental Engineering - 3
- CEE 340 Geotechnical Engineering - 3
- CEE 345 Water Resources Engineering - 3
- CEE 346 Structural Engineering - 3

**Civil Engineering Core Courses Recommended:**

- CEE 401 Engineering Core Courses Required
- CEE 405 Charged Solids and Polymers
- CEE 406 Geotechnical Engineering and Energy
- CEE 408 Highway Engineering
- CEE 409 Transportation Engineering
- CEE 411 Environmental Fluid Mechanics
- CEE 414 Environmental Systems I
- CEE 412 High-Speed Rail Engineering

**Advanced Technical Courses Required:**

- CEE 413 Renewable Energy Systems
- CEE 414 Sustainable Design Eng Tech
- CEE 415 Geometric Design of Roads
- CEE 416 Traffic Capacity Analysis
- CEE 417 Urban Transportation Planning
- CEE 418 Public Transportation Systems
- CEE 419 Sustainable Design Eng Tech

**Water Resources Engineering and Science**

Science Electives Required - None

Science Electives Recommended:
- CS 357 Numerical Methods I - 3
- CEE 300 Behavior of Materials - 4
- CEE 301 Transportation Engineering - 3
- CEE 302 Construction Engineering - 3
- CEE 330 Environmental Engineering - 3
- CEE 331 Structural Engineering - 3
- CEE 340 Geotechnical Engineering - 3
- CEE 345 Water Resources Engineering - 3
- CEE 346 Structural Engineering - 3
- CEE 347 Environmental Fluid Mechanics - 3
- CEE 348 Water Resources Engineering Field Methods - 4
- CEE 498 Special Topics (Section EH) - 1 to 4

**Energy-Water-Environment Sustainability**

Science Electives Required:
- ME 200 Thermodynamics - 3
- or CHBE 32 Thermodynamics

Science Electives Recommended - None

Civil Engineering Core Courses Recommended:
- CEE 340 Energy and Global Environment - 3
- CEE 330 Environmental Engineering - 3
- CEE 345 Water Resources Engineering - 3

Advanced Technical Courses Required:
- CEE 493 Sustainable Design Eng Tech
- ABE 436 Renewable Energy Systems - 3 or 4
- ARCH 441 Heat and Moisture in Buildings - 3
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<td>CEE 424</td>
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<td>CEE 433</td>
<td>Water Technology and Policy</td>
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<td>CEE 434</td>
<td>Environmental Systems I</td>
<td>3</td>
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<tr>
<td>CEE 437</td>
<td>Water Quality Engineering</td>
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<td>CEE 446</td>
<td>Air Quality Engineering</td>
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<td>CEE 449</td>
<td>Environmental Engineering Lab</td>
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<td>CEE 450</td>
<td>Surface Hydrology</td>
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<td>CEE 452</td>
<td>Hydraulic Analysis and Design</td>
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<td>CEE 453</td>
<td>Urban Hydrology and Hydraulics</td>
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<tr>
<td>CEE 457</td>
<td>Groundwater</td>
<td>3</td>
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<td>CEE 498</td>
<td>Special Topics (Section EH)</td>
<td>1 to 4</td>
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<tr>
<td>ENG 471</td>
<td>Seminar Energy &amp; Sustain Engr</td>
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<tr>
<td>ME 400</td>
<td>Energy Conversion Systems</td>
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<tr>
<td>NPRE 402</td>
<td>Nuclear Power Engineering</td>
<td>3 or 4</td>
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<tr>
<td>NPRE 475</td>
<td>Wind Power Systems</td>
<td>3 or 4</td>
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</table>

### Societal Risk Management

Science Electives Recommended:

- FIN 221 Corporate Finance
- SE 320 Control Systems
- STAT 420 Methods of Applied Statistics
- UP 406 Urban Ecology

Civil Engineering Core Courses Required:

- CEE 340 Energy and Global Environment

Civil Engineering Core Courses Recommended:

- CEE 300 Behavior of Materials
- CEE 310 Transportation Engineering
- CEE 320 Construction Engineering
- CEE 330 Environmental Engineering
- CEE 350 Water Resources Engineering
- CEE 380 Geotechnical Engineering

Advanced Technical Courses Required:

- CEE 491 Decision and Risk Analysis (And select 3 courses from the recommended list below)

Advanced Technical Courses Recommended:

- ABE 436 Renewable Energy Systems
- CEE 401 Concrete Materials
- CEE 406 Pavement Design I
- CEE 408 Railroad Transportation Engrg
- CEE 409 Railroad Track Engineering
- CEE 416 Traffic Capacity Analysis
- CEE 417 Urban Transportation Planning
- CEE 418 Public Transportation Systems
- CEE 421 Construction Planning
- CEE 424 Sustainable Const Methods
- CEE 434 Environmental Systems I
- CEE 453 Urban Hydrology and Hydraulics
- CEE 458 Water Resources Field Methods
- CEE 465 Design of Structural Systems
- CEE 493 Sustainable Design Eng Tech
- CEE 498 Special Topics (Section PS)
- MSE 489 Matl Select for Sustainability
- UP 466 Energy, Png & Blt Environment
- UP 480 Sustainable Design Principles

Information listed in this catalog is current as of 08/2019
General Civil Engineering

Science Electives Required - Choose one course from recommended list below:

Science Electives Recommended:
- GEOL 107 Physical Geology 4
- CHEM 222 Quantitative Analysis Lecture 2
- CHEM 232 Elementary Organic Chemistry I 3 or 4
- ME 200 Thermodynamics 3
- STAT 400 Statistics and Probability I 4

Civil Engineering Core Courses Required - Must take 7 courses from list below:
- CEE 300 Behavior of Materials 4
- CEE 310 Transportation Engineering 3
- CEE 320 Construction Engineering 3
- CEE 330 Environmental Engineering 3
- CEE 340 Energy and Global Environment 3
- CEE 350 Water Resources Engineering 3
- CEE 360 Structural Engineering 3

Advanced Technical Courses Required - Option I: Pick no more than one course from each area below such that the sum of the core and advanced courses is at least 34 credit hours. Option II: Pick 2 courses from one area and no more than one course from each of the remaining areas to total 34 credit hours.

Construction:
- CEE 420 Construction Productivity 3 or 4
- CEE 421 Construction Planning 3 or 4
- CEE 422 Construction Cost Analysis 3 or 4

Environmental:
- CEE 437 Water Quality Engineering 3
- CEE 440 Fate Cleanup Environ Pollutant 4
- CEE 446 Air Quality Engineering 4

Geotechnical:
- CEE 480 Foundation Engineering 3
- CEE 483 Soil Mechanics and Behavior 4

Materials:
- CEE 401 Concrete Materials 4

Structures:
- CEE 460 Steel Structures I 3
- CEE 461 Reinforced Concrete I 3

Transportation:
- CEE 405 Asphalt Materials I 3 or 4
- CEE 406 Pavement Design I 3 or 4
- CEE 407 Airport Design 3 or 4
- CEE 408 Railroad Transportation Engrg 3 or 4
- CEE 409 Railroad Track Engineering 3 or 4
- CEE 410 Railway Signaling & Control 3 or 4
- CEE 411 RR Project Design & Constr 3 or 4
- CEE 412 High-Speed Rail Engineering 3 or 4
- CEE 415 Geometric Design of Roads 4
- CEE 416 Traffic Capacity Analysis 3 or 4
- CEE 417 Urban Transportation Planning 4

Information listed in this catalog is current as of 08/2019
Advanced Technical Courses Required:

CEE 460  Steel Structures I  3
CEE 461  Reinforced Concrete I  3

**Transportation Engineering**

Civil Engineering Core Courses Required:

CEE 310  Transportation Engineering  3

Advanced Technical Courses Required: Select 2 courses, each from a different Area

**Area 1 - Facilities:**

CEE 405  Asphalt Materials I  3 or 4
CEE 406  Pavement Design I  3 or 4
CEE 407  Airport Design  3 or 4

**Area 2 - Systems:**

CEE 407  Airport Design  3 or 4
CEE 415  Geometric Design of Roads  4
CEE 416  Traffic Capacity Analysis  3 or 4
CEE 418  Public Transportation Systems  3 or 4

**Area 3 - Railroad:**

CEE 408  Railroad Transportation Engrg  3 or 4
CEE 409  Railroad Track Engineering  3 or 4
CEE 410  Railway Signaling & Control  3 or 4
CEE 411  RR Project Design & Constr  3 or 4
CEE 412  High-Speed Rail Engineering  3 or 4

**Water Resources Engineering and Science**

Civil Engineering Core Courses Required:

CEE 350  Water Resources Engineering  3

Advanced Technical Courses Required: 2 courses from the recommended list below.

**Advanced Technical Courses Recommended:**

CEE 432  Stream Ecology  3 or 4
CEE 433  Water Technology and Policy  3 or 4
CEE 450  Surface Hydrology  3
CEE 451  Environmental Fluid Mechanics  3
CEE 452  Hydraulic Analysis and Design  3
CEE 453  Urban Hydrology and Hydraulics  4
CEE 457  Groundwater  3
CEE 458  Water Resources Field Methods  4
CEE 498  Special Topics (Section EH)  1 to 4

**Energy-Water-Environment Sustainability**

Civil Engineering Core Courses Required:

CEE 340  Energy and Global Environment  3

Advanced Technical Courses Required:

CEE 493  Sustainable Design Eng Tech (and select one course from the recommended list below)  4

**Advanced Technical Courses Recommended:**

ABE 436  Renewable Energy Systems  3 or 4
ARCH 441  Heat and Moisture in Buildings  3
CEE 424  Sustainable Const Methods  4
CEE 433  Water Technology and Policy  3 or 4
CEE 434  Environmental Systems I  3
CEE 437  Water Quality Engineering  3
CEE 446  Air Quality Engineering  4
CEE 449  Environmental Engineering Lab  3

CEE 450  Surface Hydrology  3
CEE 452  Hydraulic Analysis and Design  3
CEE 453  Urban Hydrology and Hydraulics  4
CEE 457  Groundwater  3
CEE 498  Special Topics (Section EH)  1 to 4
ENG 471  Seminar Energy & Sustain Engrg  1
ME 400  Energy Conversion Systems  3 or 4
NPRE 402  Nuclear Power Engineering  3 or 4
NPRE 475  Wind Power Systems  3 or 4

**Societal Risk Management**

Civil Engineering Core Courses Required - None

Advanced Technical Courses Required:

CEE 491  Decision and Risk Analysis (and select one from the recommended list below)  3 or 4

**Advanced Technical Courses Recommended:**

CEE 406  Pavement Design I  3 or 4
CEE 416  Traffic Capacity Analysis  3 or 4
CEE 417  Urban Transportation Planning  4
CEE 437  Water Quality Engineering  3
CEE 440  Fate Cleanup Environ Pollutant  4
CEE 449  Environmental Engineering Lab  3
CEE 460  Steel Structures I  3
CEE 461  Reinforced Concrete I  3
CEE 465  Design of Structural Systems  3
CEE 472  Structural Dynamics I  3 or 4
CEE 498  Special Topics (Section EW)  1 to 4
IE 410  Advanced Topics in Stochastic Processes & Applications  3 or 4
NPRE 442  Radioactive Waste Management  3
SE 450  Decision Analysis I  3 or 4
STAT 425  Applied Regression and Design  3 or 4
STAT 429  Time Series Analysis  3 or 4
STAT 430  Topics in Applied Statistics  3 or 4
UP 438  Disasters and Urban Planning  4

**Sustainable and Resilient Infrastructure Systems**

Civil Engineering Core Courses Required:

CEE 340  Energy and Global Environment  3

Advanced Technical Courses Recommended:

CEE 300  Behavior of Materials  4
CEE 310  Transportation Engineering  3
CEE 320  Construction Engineering  3
CEE 330  Environmental Engineering  3
CEE 350  Water Resources Engineering  3
CEE 380  Geotechnical Engineering  3

**Advanced Technical Courses Required:**

CEE 491  Decision and Risk Analysis (And select one course from the recommended list below)  3 or 4

**Advanced Technical Courses Recommended:**

ABE 436  Renewable Energy Systems  3 or 4
CEE 401  Concrete Materials  4
CEE 406  Pavement Design I  3 or 4
CEE 408  Railroad Transportation Engrg  3 or 4
CEE 409  Railroad Track Engineering  3 or 4

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<td>CEE 417</td>
<td>Urban Transportation Planning</td>
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<td>CEE 418</td>
<td>Public Transportation Systems</td>
<td>3 or 4</td>
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<tr>
<td>CEE 421</td>
<td>Construction Planning</td>
<td>3 or 4</td>
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<tr>
<td>CEE 422</td>
<td>Sustainable Const Methods</td>
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<td>CEE 434</td>
<td>Environmental Systems I</td>
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<td>4</td>
</tr>
<tr>
<td>UP 480</td>
<td>Sustainable Design Principles</td>
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</tbody>
</table>

**Global Context**

Science Electives Recommended:

- CPSC 116 The Global Food Production Web 3
- ESE 140 Climate and Global Change 3
- ESE 320 Water Planet, Water Crisis 3
- ESE 482 Challenges of Sustainability 3

CEE Engineering Core Courses Recommended:

- CEE 330 Environmental Engineering 3
- CEE 340 Energy and Global Environment 3

Advanced Technical Courses Recommended: Must take at least 3 credit hours in each of the 2 areas below:

**Knowledge and Skills Needed to Effectively Address Global Issues:**

- ACE 451 Agriculture in Intl Dev 3 to 4
- ATMS 421 Earth Systems Modeling 4
- CEE 438 Science & Environmental Policy 3
- CEE 445 Air Quality Modeling 4
- CEE 447 Atmospheric Chemistry 4
- CEE 450 Surface Hydrology 3
- ECON 420 International Economics 2 to 4
- Global CEE Design:
  - CEE 408 Railroad Transportation Engrg 3 or 4
  - CEE 417 Urban Transportation Planning 4
  - CEE 437 Water Quality Engineering 3
- CEE 449 Environmental Engineering Lab 3
- CEE 465 Design of Structural Systems 3

**CEE Multidisciplinary**

Science Electives Recommended: Any recommended science electives from existing CEE Primary and Secondary listed above

CEE Engineering Core Courses Recommended: Core courses relevant to the student's interests

Advanced Technical Courses: Students work with CEE Academic Advisors

**Atmosphere Science (Primary Field: Environmental Engineering)**

CEE 330 Environmental Engineering 3

Advanced Technical Courses Recommended:

- ATMS 302 Atmospheric Dynamics I 3
- ATMS 410 Radar Remote Sensing 4
- ATMS 411 Satellite Remote Sensing 4
- ATMS 421 Earth Systems Modeling 4
- CEE 445 Air Quality Modeling 4
- CEE 447 Atmospheric Chemistry 4

**Chemistry (Primary Field: Environmental Engineering)**

CEE 330 Environmental Engineering 3

Advanced Technical Courses Recommended:

- CHEM 232 Elementary Organic Chemistry I 3 or 4
- CHEM 315 Instrumental Chem Systems Lab 2
- CHEM 332 Elementary Organic Chem II 4
- CHEM 420 Instrumental Characterization 2
- CHEM 440 Physical Chemistry Principles 4

**Chemical Engineering (Primary Field: Environmental Engineering)**

CEE 330 Environmental Engineering 3

Advanced Technical Courses Recommended:

- CHBE 321 Thermodynamics 4
- CHBE 421 Momentum and Heat Transfer 4
- CHBE 422 Mass Transfer Operations 4
- CHBE 424 Chemical Reaction Engineering 3

**Microbiology (Primary Field: Environmental Engineering)**

CEE 330 Environmental Engineering 3

Advanced Technical Courses Recommended:

- MCB 301 Experimental Microbiology 3
- MCB 431 Microbial Physiology 3
- MCB 450 Introductory Biochemistry 3
- CEE 444 Env Eng Principles, Biological 4

**Toxicology (Primary Field: Environmental Engineering)**

CEE 330 Environmental Engineering 3

Advanced Technical Courses Recommended:

- CHEM 332 Elementary Organic Chem II 4
- ENVS 431 Environ Toxicology & Health 3
- ENVS 480 Basic Toxicology 3
- MCB 450 Introductory Biochemistry 3

**Liberal Education**

The liberal education courses (https://wiki.cites.illinois.edu/wiki/display/ugadvis/Liberal+Education+Electives) develop students' understanding of human culture and society, build skills of inquiry and critical thinking, and lay a foundation for civic engagement and lifelong learning.

<table>
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<tr>
<td>ECON 102</td>
<td>Microeconomic Principles (Recommended)</td>
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<tr>
<td>or ECON 103</td>
<td>Macroeconomic Principles</td>
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Electives from the campus General Education Social and Behavioral Sciences list.
Electives from the campus General Education Humanities and the Arts list.

Electives either from a list approved by the college, or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts.

Total Hours 18

Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course, (ii) one non-western culture(s) course, and (iii) one U.S. Minority Culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western, non-western, and US minority lists that fall into free electives or other categories may also be used to satisfy the cultural studies requirements.

Composition
These courses teach fundamentals of expository writing.

Code Title Hours
RHET 105 Writing and Research 4
BTW 261 Principles Tech Comm (satisfies the Advanced Composition requirement) 3

Total Hours 7

Free Electives
These unrestricted electives, subject to certain exceptions as noted at the College of Engineering Advising Website (https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-FreeElectives), give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

Code Title Hours
Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site, so that there are at least 128 credit hours earned toward the degree.

Suggested Sequence
The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual’s case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

First Year
First Semester
CEE 195 About Civil Engineering 1
CHEM 102 General Chemistry I 3
CHEM 103 General Chemistry Lab I 1
ENG 100 Engineering Orientation 0
SE 101 Engineering Graphics Design or RHET 105 3-4
MATH 221 Calculus I 4
Liberal education elective 3

Semester Hours 15-16

Second Semester
CHEM 104 General Chemistry II 3
CHEM 105 General Chemistry Lab II 1
MATH 225 Introductory Matrix Theory 2
MATH 231 Calculus II 3
PHYS 211 University Physics: Mechanics 4
RHET 105 Writing and Research 4-3 or SE 101

Semester Hours 17-16

Second Year
First Semester
CEE 201 Systems Engr Economics 3
MATH 241 Calculus III 3
PHYS 212 University Physics: Elec Mag 4
TAM 211 Statics 3
Free elective 3

Semester Hours 17

Second Semester
CEE 202 Engineering Risk Uncertainty 3
CS 101 Intro Computing: Engrg Sci 3
PHYS 213 Univ Physics: Thermal Physics 2
TAM 212 Introductory Dynamics 3
TAM 251 Introductory Solid Mechanics 3
Liberal education elective 3

Semester Hours 17

Third Year
First Semester
MATH 285 Intro Differential Equations 3
TAM 335 Introductory Fluid Mechanics 4
Civil engineering technical courses 5
Science elective 6

Semester Hours 16

Second Semester
BTW 261 Principles Tech Comm 3
Civil engineering technical courses 5 10
Liberal education elective 3

Semester Hours 16

Fourth Year
First Semester
CEE 495 Professional Practice 0
Civil engineering technical courses 5 9
Liberal education electives 6

Semester Hours 15

Second Semester
Civil engineering technical courses 5 9
Liberal education elective 3
Free elective 3

Semester Hours 15

Total Hours: 128

1 Offered in the fall semester should be taken in the first or second semester of enrollment in Civil Engineering.

Information listed in this catalog is current as of 08/2019
RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is SE 101.

MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

Liberal education electives (https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-LiberalEducationElectives) must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. ECON 102 or ECON 103 must be one of the social & behavioral sciences courses. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course, (ii) one non-western culture(s) course, and (iii) one U.S. Minority Culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western, non-western, and US minority lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.

Civil engineering technical courses are defined as core courses and advanced technical electives and must total 34 hours of credit. Five courses and a minimum of fifteen hours must be core courses as outlined in the Civil Engineering Undergraduate Handbook. Advanced technical electives are selected to correspond with chosen primary and secondary areas of emphasis in civil engineering as outlined in the Civil Engineering Undergraduate Handbook. A minimum of twelve and six hours must be taken for the primary and secondary areas, respectively.

The science elective is selected in accord with recommendations for the chosen primary area of emphasis in civil engineering as outlined in the Civil Engineering Undergraduate Handbook.