Civil Engineering, BSE

Civil Engineering is a profession that deals with the infrastructure of society and impacts your everyday life. From the roads and bridges you use every day to the drinking water that comes out of your tap at home, civil engineers work to develop safe, efficient and sustainable ways to continually improve our infrastructure.

Concentrations
- Geotechnical engineering
- Structural engineering
- Transportation and municipal engineering
- Water resources and environmental engineering

Research
Work with faculty engaged in leading-edge research in areas such as:
- Social and environmental impacts of transportation development
- Flexible pavement design
- Fatigue and fracture mechanics
- Hydrodynamic modeling
- Environmental fluid mechanics
- Application of nanomaterials in construction

Career Paths
Civil engineers work in all levels of government and throughout the private sector.
- Structural Designer
- Construction Manager
- City Engineer
- Stormwater Manager
- Foundation Engineer
- Resident Engineer

Accreditation
The Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET: https://www.abet.org (https://tinyurl.com/u7fsfevw/).

New Freshmen
Admission to the College of Engineering and Applied Science is based on an overall assessment of both academic and non-academic qualifications. The primary review factors for admission are the strength and quality of the high school curriculum, high school class percentile, grade point average, and the result of the ACT or SAT. Well-prepared freshman applicants will have four years of mathematics (including one-and-a-half years of algebra, one year of geometry, and one-half year of trigonometry) and four years of natural science (including biology, chemistry, and physics). The College also will consider non-academic qualifications such as leadership skills, diversity in personal background, work experience, motivation, and maturity.

Freshmen applicants will be considered for admission directly to the major or to intended status (Engineering-Intended or Computer Science-Intended). Admission directly to the major is selective.

Transfer Students
Transfer student admission is based on an overall assessment of both academic and non-academic qualifications. For transfer applicants, the primary factors considered for admission are the grade point average on transferable courses and the level of curriculum completion. The College also will consider non-academic qualifications such as leadership skills, diversity in personal background, work experience, motivation, and maturity.

Transfer applicants will be considered for admission directly to the major or to intended status (Engineering-Intended or Computer Science-Intended).

Admission to the Major
Students admitted to Engineering-Intended or Computer Science-Intended may apply for major status with their academic advisor at the time they believe they meet the requirements. The program may impose major status as a prerequisite for courses numbered 200 or above.

1. Complete first semester calculus with a C or better grade.
2. Complete GER Oral and Written Communication Part A.
3. Engineering majors must complete Chem 100 with a C or better grade (or satisfactory score on the placement test). Computer Science majors must complete CompSci 251 with a C or better grade.
4. Obtain a minimum grade point as set by the major department. A 3.00 GPA guarantees admission to any CEAS major.
5. Courses required by the major may be repeated only once. No more than two courses may be repeated.

Questions on admission to CEAS or choosing a major should be directed to the Office of Student Services, (414) 229-4667.

Civil Engineering Curriculum

The minimum number of credits required to complete the Bachelor of Science in Engineering with a major in civil engineering is 120.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CIV ENG 203</td>
<td>Introduction to Solid Mechanics</td>
<td>4</td>
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<tr>
<td>CIV ENG 202</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EAS 200</td>
<td>Professional Seminar</td>
<td>1</td>
</tr>
<tr>
<td>IND ENG 111</td>
<td>Introduction to Engineering</td>
<td>3</td>
</tr>
<tr>
<td>IND ENG 112</td>
<td>Engineering Drawing &amp; Computer Aided Design/Drafting</td>
<td>3</td>
</tr>
<tr>
<td>IND ENG 360</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>IND ENG 367</td>
<td>Introductory Statistics for Physical Sciences and Engineering Students</td>
<td>3</td>
</tr>
<tr>
<td>MECHENG 320</td>
<td>Introduction to Fluid Mechanics</td>
<td>3</td>
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</tbody>
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<thead>
<tr>
<th>Major Requirements (26 Credits)</th>
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<tbody>
<tr>
<td>CIV ENG 250</td>
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<tr>
<td>CIV ENG 335</td>
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<tr>
<td>CIV ENG 372</td>
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<td>CIV ENG 411</td>
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<td>CIV ENG 413</td>
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<tr>
<td>CIV ENG 431</td>
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<tr>
<td>CIV ENG 490</td>
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<tr>
<td>CIV ENG 494</td>
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</tbody>
</table>
Mathematics Requirement (16 Credits) ³

- MATH 231 Calculus and Analytic Geometry I 4
- MATH 232 Calculus and Analytic Geometry II 4
- MATH 233 Calculus and Analytic Geometry III 4
- ELECENG 234 Analytical Methods in Engineering 4

Chemistry Requirement (5 Credits)

- CHEM 105 General Chemistry for Engineering 5
  or CHEM 102 General Chemistry

Physics Requirement (8 Credits)

- PHYSICS 209 Physics I (Calculus Treatment) 8
  & PHYSICS 210 Physics II (Calculus Treatment)

Technical Electives - Select 18 credits from approved lists 18

GER Distribution Requirement (15 Credits)

- Select 3 credits in Art 3
- Select 3 credits in Humanities 3
- Select 6 credits of Social Science 6

ENGLISH 310 Writing, Speaking, and Technoscience in the 21st Century 3

Cultural Diversity - One of the arts, humanities, or social science courses selected must also meet the UWM cultural diversity requirement.

Free Electives - Select 9 credits of free electives 9

Students must also satisfy Oral and Written Communication (OWA) Part A ³

Students must also Satisfy the UWM Foreign Language requirements ⁴

Total Credits 120

1 MECHENG 110 and MECHENG 111 may substitute for IND ENG 111 and IND ENG 112 for students transferring from another engineering major.
2 Civil engineering majors may take MATLENG 201 in place of CIV ENG 431.
3 MATH 221, MATH 222 and two free elective credits may substitute for MATH 231, MATH 232 and MATH 233.
4 See General Education Requirements (http://catalog.uwm.edu/policies/undergraduate-policies/#generaleducationtext)

Technical Electives

A minimum of 18 technical elective credits are required. At least 9 credits are required from Group A Technical Electives. Normally a minimum of 12 credits will be taken in an area of concentration.

Areas of Concentration

The Civil & Environmental Engineering Department offers numerous elective courses that allow students to work in one of four areas of concentration.

<table>
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<tr>
<th>Code</th>
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<tr>
<td>CIV ENG 495</td>
<td>Senior Design</td>
<td>3</td>
</tr>
</tbody>
</table>

Geotechnical Engineering

Students in this concentration should complete:

- CIV ENG 456 Foundation Engineering
- And at least three of the following courses:
  - CIV ENG 360 Introduction to Structural Analysis
  - CIV ENG 401 Intermediate Strength of Materials

CIV ENG 412 Applied Hydrology
CIV ENG 463 Introduction to Finite Elements
CIV ENG 492 Environmental Impact Assessment
CIV ENG 598 Pavement Analysis and Design

Municipal and Transportation Engineering

Students in this concentration should complete at least three of the following:

- CIV ENG 492 Environmental Impact Assessment
- CIV ENG 590 Urban Transportation Planning
- CIV ENG 592 Traffic Control
- CIV ENG 594 Physical Planning and Municipal Engineering
- CIV ENG 596 Transportation Facilities Design
- CIV ENG 598 Pavement Analysis and Design
- CIV ENG 610 Introduction to Water and Sewage Treatment

Structural Engineering

Students in this concentration should complete:

- CIV ENG 360 Introduction to Structural Analysis
- CIV ENG 401 Intermediate Strength of Materials
- CIV ENG 463 Introduction to Finite Elements

And at least two of the following courses:

- CIV ENG 431 Materials of Construction
- CIV ENG 456 Foundation Engineering
- CIV ENG 466 Mechanics of Composite Materials
- CIV ENG 560 Intermediate Structural Analysis
- CIV ENG 571 Design of Concrete Structures
- CIV ENG 572 Design of Steel Structures
- CIV ENG 573 Design of Masonry and Wood Structures
- CIV ENG 574 Design of Prestressed Concrete Structures
- CIV ENG 579 Earthquake Engineering

Water Resources and Environmental Engineering

Students in this concentration should complete at least three of the following:

- CIV ENG 311 Introduction to Energy, Environment and Sustainability
- CIV ENG 412 Applied Hydrology
- CIV ENG 511 Water Supply and Sewerage
- CIV ENG 521 Water Quality Assessment
- CIV ENG 610 Introduction to Water and Sewage Treatment
- CIV ENG 614 Hazardous Waste Management

Technical Electives

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</tr>
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<td>CIV ENG 598</td>
<td>Pavement Analysis and Design</td>
<td></td>
</tr>
</tbody>
</table>

Group A Technical Electives - Take 9 to 18 credits of Group A electives. All non-required Civ Eng courses 400-699 are Group A Technical Electives.

- CIV ENG 311 Introduction to Energy, Environment and Sustainability
- CIV ENG 360 Introduction to Structural Analysis
- CIV ENG 401 Intermediate Strength of Materials
CIV ENG 412  Applied Hydrology
CIV ENG 431  Materials of Construction
CIV ENG 456  Foundation Engineering
CIV ENG 463  Introduction to Finite Elements
CIV ENG 466  Mechanics of Composite Materials
CIV ENG 480  Software Applications for Civil Engineering
CIV ENG 492  Environmental Impact Assessment
CIV ENG 502  Experimental Stress Analysis
CIV ENG 511  Water Supply and Sewerage
CIV ENG 521  Water Quality Assessment
CIV ENG 555  Sustainable Construction Materials and Technologies
CIV ENG 560  Intermediate Structural Analysis
CIV ENG 571  Design of Concrete Structures
CIV ENG 572  Design of Steel Structures
CIV ENG 573  Design of Masonry and Wood Structures
CIV ENG 574  Design of Prestressed Concrete Structures
CIV ENG 579  Earthquake Engineering
CIV ENG 590  Urban Transportation Planning
CIV ENG 592  Traffic Control
CIV ENG 594  Physical Planning and Municipal Engineering
CIV ENG 596  Transportation Facilities Design
CIV ENG 598  Pavement Analysis and Design
CIV ENG 610  Introduction to Water and Sewage Treatment
CIV ENG 614  Hazardous Waste Management
CIV ENG 616  Computational Hydraulics and Environmental Flows
CIV ENG 691  Topics in Civil Engineering:

**Group B Technical Electives**

Select no more than 6 credits from the following list:

- CHEM 104  General Chemistry and Qualitative Analysis ¹
- Any Chemistry course 200-level or above
- COMPSCI 250  Introductory Computer Programming
- EAS 1  Engineering Co-op Work Period ²
- ENGLISH 206  Technical Writing
- ELECENG 301  Electrical Circuits I
- GEOG 215  Introduction to Geographic Information Science
- GEOG 403  Remote Sensing: Environmental and Land Use Analysis
- IND ENG 455  Operations Research I
- IND ENG 465  Operations Research II
- IND ENG 475  Simulation Methodology
- MATH 313  Linear Programming and Optimization
- MATH 321  Vector Analysis
- MATH 322  Introduction to Partial Differential Equations
- Any Mathematics course 400-level or above

MATLENG 431  Welding Engineering
MECHENG 301  Basic Engineering Thermodynamics
MECHENG 321  Basic Heat Transfer
PHYSICS 214  Lab Physics I (Calculus Treatment)
PHYSICS 215  Lab Physics II (Calculus Treatment)

Any Physics course 300-level or above

URBPLAN 591  Introduction to Urban Geographic Information Systems (GIS) in Planning

¹  Students who take CHEM 104 satisfy 3 credits of Group B Electives.
²  Students who earn 3 or more credits of Co-op may use 3 of those credits as approved technical electives.

**Minimum Requirements**

Students must maintain an average GPA of at least 2.00 on all work attempted at the University and in all courses offered by the College. Students majoring in biomedical engineering, computer engineering, computer science, industrial engineering, and materials engineering must maintain an average GPA of at least 2.00 in all 300-level and above courses in the student’s major department. Students majoring in civil engineering, electrical engineering, and mechanical engineering must maintain an average GPA of at least 2.50 in all 300-level and above courses in the major department. Transferable courses will be included as appropriate. Advancement to major status is required for graduation.

In order to provide maximum flexibility while preserving the institutional identity of a UWM degree, the College requires residence:

1. during the last 30 credits, or
2. during 45 of the last 60 credits, or
3. during any 90 credits of a student’s undergraduate career.

At least 15 credits of advanced work in the major must be completed in residence at UWM.

A student who does not maintain continuous registration during the academic year and is re-admitted to the College must meet the program and graduation requirements in effect at the time of re-entry.

Degree and major requirements must be completed within 10 years of initial enrollment at UW-Milwaukee. Should students not complete the major within the 10-year time frame, the students will switch to the most current degree and major requirements. A new 10-year time frame would then begin.

**Dual Majors**

Students wishing to major in more than one field can do so in two ways:

1. Complete the requirements for more than one major before receiving a degree from the College. In this case, the degree will list both majors.
2. Be admitted to the College as a second degree candidate (after earning a bachelor’s degree in any field), providing University and College entrance requirements are met. Such a student must meet all undergraduate degree requirements in the College and present a minimum of 30 credits beyond the previous bachelor’s degree.
Concurrent Registration at Other Institutions

CEAS students wishing to establish concurrent enrollment at another institution must obtain prior permission from their academic advisor.

Student Academic Appeals

Students may appeal an academic action to the Office of Student Services. An appeal is a request for an exception to an established policy or rule. The content of each appeal is carefully reviewed in order to reach a decision. Appeals should be submitted in writing to the Office of Student Services. The appeals committee considers individual cases concerning the degree requirements and other academic rules and regulations established by the College of Engineering and Applied Science faculty.

The College of Engineering and Applied Science has established written procedures for undergraduate student academic grievances. Copies of the grievance procedure are available in the Office of Student Services. As a first step, students must discuss the grievance with the faculty member or administrator as soon as possible to attempt to resolve the issue, but not later than 30 days after the action that prompted the grievance/appeal.

Computer Science and Engineering Programs

Detailed descriptions of the CEAS undergraduate programs are provided in this catalog. All courses are not offered every semester. A few technical elective courses may be offered only once every three to four semesters. In addition, since computer science and engineering curricula are continually evolving to keep current, students are encouraged to consult with their advisors to plan each semester's list of classes. Part-time students should always maintain a plan that looks ahead two to three semesters to avoid scheduling difficulties.

The curricula outlined in the pages are applicable to new students entering CEAS in fall 2016 or later. Students who enrolled in computer science or engineering programs prior to that date should consult with the appropriate previous editions of this catalog for information about their program requirements. As a general rule, when program changes occur, continuing students have the choice of continuing in their existing program or following the new requirements. Occasionally, a program change will be required of all students regardless of their date of matriculation, so long as it does not increase the total credits needed for graduation.

These program descriptions represent the minimum requirements for graduation from UWM in computer science or engineering. In all cases, it is important that students consult with their advisor before making course selections to avoid errors in programming.

Academic Advising

The Office of Student Services in the College of Engineering and Applied Science, located in Room E386 of the Engineering and Mathematical Sciences Building, offers undergraduate students academic advising from professional advisors who are familiar with the curriculum, College requirements, and the special needs of engineering and computer science students. These advisors provide services such as freshman orientation, course selection, program planning, and credit transfer evaluation. Students are assigned to a permanent professional advisor as soon as they are accepted into the College, and are urged to confer with their advisor at least once each semester. Students also are assigned to a faculty advisor who provides technical expertise specific to the student’s area of study.

We understand that it can be a delicate balance managing school, work, family, and active social lives. The College of Engineering and Applied Science advisors are here to help you achieve that balance.

You will be assigned a professional academic advisor upon being admitted to the College of Engineering & Applied Science. Your advisor will work with you throughout your undergraduate experience, providing guidance on:

- course registration,
- graduation planning,
- career preparation,
- and serving as a liaison to the many other resources available on our campus.

Advisors are also a great source of information on student organizations, tutoring and scholarship opportunities.

In addition to professional academic advisors, you will also have access to faculty advisors. These advisors can provide insights into the technical aspects of the engineering and computer science curricula while mentoring you as you define your professional goals.

Honors in the College of Engineering and Applied Science

Dean’s Honor List

GPA of 3.500 or above, earned on a full-time student’s GPA on 12 or more graded credits in a given semester.

Honors College Degree and Honors College Degree with Distinction

Granted to graduating seniors who complete Honors College requirements, as listed in the Honors College (http://catalog.uwm.edu/opportunities-resources/honors-college/) section of this site.

Commencement Honors

Students with a cumulative GPA of 3.500 or above, based on a minimum of 40 graded UWM credits earned prior to the final semester, will receive all-university commencement honors and be awarded the traditional gold cord at the December or May Honors Convocation. Please note that for honors calculation, the GPA is not rounded and is truncated at the third decimal (e.g., 3.499).

Final Honors

Earned on a minimum of 60 graded UWM credits: Cum Laude · 3.500 or above; Magna Cum Laude · 3.650 or above; Summa Cum Laude · 3.800 or above.

Joint Programs with Other Campuses

Pre-engineering

Qualified students may enroll in coordinated pre-engineering programs at UW-Green Bay, UW-Parkside, and UW-Waukesha for two years of pre-engineering coursework. These coordinated programs ensure equivalent
coursework, appropriate advising, and early access to the Cooperative Education Program at UWM.

**Dual Degree Programs**
Qualified students may enroll in coordinated dual degree programs at Alverno College, Carroll University, UW-Eau Claire, UW-Green Bay, UW-La Crosse, UW-Oshkosh, UW-Stevens Point, UW-Whitewater and Wisconsin Lutheran College. Students in these programs will earn a bachelor’s degree at both universities in five years. Students transfer to UWM after three years at the partner university. For more information, contact the Office of Student Services at (414) 229-4667.

**Joint Programs with Wisconsin Technical Colleges**

**Gateway Technical College**
An agreement with GTC allows those students having associate degrees in the Electrical Engineering - Technology the opportunity to be given credit for courses required in the UWM bachelor of science in engineering program. For more information, contact the Office of Student Services at (414) 229-4667.

**Milwaukee Area Technical College**
An agreement with MATC allows joint admission and enrollment at MATC and CEAS. Qualified students may take English, mathematics, chemistry, and general education courses at MATC. The program ensures equivalent coursework and appropriate advising. Students complete a bachelor of science degree in engineering or computer science at UWM.

**Waukesha County Technical College**
An agreement with WCTC allows those students having associate degrees in the Industrial Occupations Division at WCTC the opportunity to be given credit for courses required in the UWM bachelor of science in engineering or bachelor of science in computer science program. For more information, contact the Office of Student Services at (414) 229-4667.