

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
- Civil Drafter
- Senior Pipeline Engineer
- Project Engineer
- Construction Inspector

Accreditation

The civil engineering program is accredited by the Engineering Accreditation Commission of ABET, 415 N. Charles Street, Baltimore, MD 21201, (410) 347-7700.

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 the First-Year Program. 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 the Transfer Transition Program based on the number of transfer credits and GPA.

Admission to the Major

Students admitted to the First-Year Program or Transfer Transition Program (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.

First-Year students have a maximum of three semesters to complete the admission to major requirements. Part-time students may be granted an extension by their academic advisor.

Transfer Transition students have a maximum of two semesters to complete the admission to major requirements. Part-time students may be granted an extension by their academic advisor.

Placement Testing

Most new freshmen are required to take placement exams in English and mathematics. Engineering students also take a placement exam in chemistry, provided they have had previous coursework in chemistry. Students with previous college-level credits in chemistry, English, and math may not be required to take placement tests. Additional prerequisite coursework may be required as a result of these placement tests. Credit for prerequisite academic work may not count toward the degree program. Entering students are urged to take their placement exams when scheduled. All placement exams must be completed before beginning coursework in the subject area. Students who place into precalculus math courses may be asked to participate in an online summer bridge program.

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 127. Students who need background preparation courses in math, English, foreign language, and chemistry may need additional credits.

Code	Title	Credits
Engineering Core		
CIV ENG 201	Statics	3
CIV ENG 202	Dynamics	3
CIV ENG 280	Computer Based Engineering Analysis	3
CIV ENG 303	Strength of Materials	4
EAS 200	Professional Seminar	1
IND ENG 111	Introduction to Engineering ¹	3
IND ENG 112	Engineering Drawing & Computer Aided Design/Drafting ¹	3
IND ENG 360	Engineering Economic Analysis	3
MATLENG 201	Engineering Materials ²	4
MECHENG 301	Basic Engineering Thermodynamics	3
MECHENG 320	Introduction to Fluid Mechanics	3
Major Requirements		
CIV ENG 250	Engineering Surveying	3
CIV ENG 335	Soil Mechanics	3
CIV ENG 372	Introduction to Structural Design	4
CIV ENG 411	Engineering Principles of Water Resources Design	3
CIV ENG 413	Environmental Engineering	3
CIV ENG 490	Transportation Engineering	3
CIV ENG 494	Principles of Civil Engineering Design	1
CIV ENG 495	Senior Design	3
Mathematics Requirement		
Select one of the following sequences:		10-12
Sequence 1:		
MATH 231 & MATH 232 & MATH 233	Calculus and Analytic Geometry I and Calculus and Analytic Geometry II and Calculus and Analytic Geometry III	
Sequence 2:		
MATH 221 & MATH 222	Honors Calculus I and Honors Calculus II	
ELECENG 234	Analytical Methods in Engineering	4
Chemistry Requirement		
One of the following sequences must be completed:		5-10
CHEM 105	General Chemistry for Engineering (suggested)	
CHEM 102 & CHEM 104	General Chemistry and General Chemistry and Qualitative Analysis	
Physics Requirement		
PHYSICS 209 & PHYSICS 210	Physics I (Calculus Treatment) and Physics II (Calculus Treatment)	8
Other Natural Sciences		
Select one of the following:		3
Any GEO SCI course 300 level or above		
Any BIO SCI course 150 level or above		
Any ATM SCI course 200 level or above		
GER Distribution Requirement		
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
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Cultural Diversity - One of the arts, humanities, or social science courses selected must also meet the UWM cultural diversity requirement.

Free Electives

Select 3 credits of free electives	3
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English Composition Requirement

Select one of the following: ³	0-6
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Earn a satisfactory score on the English placement test; or

Earn a grade of C or higher in ENGLISH 102; or

Transfer a grade of C or better in a course (3 credits of more) equivalent to English 102 or higher level expository writing course

Foreign Language Requirement

Select one of the following:	0-8
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Complete two years of a single foreign language in high school

Complete two semesters of a single foreign language in college

Demonstrate ability by examination

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 CIV ENG 431 (with proper prerequisites) in place of MATLENG 201.

³ **Placement Examinations.** Once admitted to UWM, most engineering students are required to take placement examinations in mathematics, English, and chemistry. Students with previous college-level credits in these areas may not be required to take placement exams. The placement exams are administered by the UWM Testing Center, Mellencamp Hall, Room B28, (414) 229-4689. The results of these tests help students determine the appropriate course in which to register. Background prerequisite courses may be required in addition to the courses listed above.

Technical Electives

A minimum of 21 technical elective credits are required. At least 15 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.

Code	Title	Credits
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 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 463	Introduction to Finite Elements
CIV ENG 571	Design of Concrete Structures
CIV ENG 572	Design of Steel Structures

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 573	Design of Masonry 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 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

Technical Electives

Code **Title** **Credits**

Group A Technical Electives - Take 15 to 21 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 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 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 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 367	Introductory Statistics for Physical Sciences and Engineering Students
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 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 to 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.

Program Educational Objectives

The educational objectives of the undergraduate Civil Engineering Program are:

1. Graduates apply broad-based knowledge of mathematics, science, and engineering science for solving engineering problems and creating engineering designs in the civil engineering profession.
2. Graduates demonstrate leadership in infrastructure design by creating solutions for complex urban problems by synthesizing and implementing knowledge from multiple disciplines.
3. Graduates are leaders in the workplace and in professional organizations by demonstrating effective communication skills, ethical responsibility, and social awareness.
4. Graduates adapt to changes in the urban and global environment by exhibiting intellectual curiosity, innovating, pursuing continuous education, and embracing diverse ideas.

Objective 1

Graduates apply broad-based knowledge of mathematics, science, and engineering science for solving engineering problems and creating engineering designs in the civil engineering professional field.

This objective implies that graduates will have a solid preparation that includes the knowledge of mathematics, sciences, statistics, engineering science disciplines, and computer applications as a foundation for later studies and lifelong learning. Through a rigorous program preparation, graduates will also be well-versed in different ways of addressing engineering problems.

Objective 2

Graduates demonstrate leadership in infrastructure design by creating solutions for complex urban problems by synthesizing and implementing knowledge from multiple disciplines.

This objective implies that graduates will have the necessary breadth and depth of technical knowledge and professional training to sustain a lengthy career as a civil engineer. It also encompasses broad knowledge of four traditional fields of civil engineering such as with an in-depth specialization knowledge in one focus area, as well as proficiency in experimentation, design, professional tools, communication skills, relationships between the engineering design and legal, environmental, and societal concerns.

Objective 3

Graduates are leaders in the workplace and in professional organizations by demonstrating effective communication skills, ethical responsibility, and social awareness.

This objective relates to the non-technical aspects of professional practice. Included in professional preparation are ethics, participation in professional organizations, interactions between professionals, and integrating non-engineering factors in designs and decisions.

Objective 4

Graduates adapt to changes in the urban and global environment by exhibiting intellectual curiosity, innovating, pursuing continuous education, and embracing diverse ideas.

This objective recognizes the speed of technological change, changing professional environments, and the need to keep the program up-to-date, both in terms of the knowledge transmitted and the means by which it is transmitted.

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 Degree and Honors Degree with Thesis

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. In schools and colleges in which fewer than 15% of the traditional students have a 3.500 GPA, all-university honors will be awarded to approximately the top 15% of graduating students. A criterion GPA (not lower than 3.200) for this 15% will be calculated based on statistics from the previous comparable semester. 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.