

# Civil Engineering

## Civil Engineering Major

The Civil Engineering curriculum is designed to give students a strong mathematical, scientific and engineering background in all of the areas of the field. At the same time it provides students with an opportunity to place further emphasis on his/her chosen areas through technical electives.

Twelve credits of technical electives are required. Students are required to choose three technical electives from the five major areas, while at the same time satisfying the ABET design requirement. All Civil Engineering students must take a capstone design course, CE 489 Senior Design, which is designed to bring concepts learned in different courses to culminate in a major design experience.

Students interested in structural engineering may choose courses such as finite element analysis, advanced reinforced concrete, advanced steel design, timber design, pre-stressed concrete, foundation engineering, and dynamics of structures.

Students interested in water resources, or environmental engineering may choose courses such as solid waste management, applied hydrology, watershed modeling, ground water and seepage, water and wastewater engineering, open channel flow, hazardous waste management, and water quality management.

Students interested in transportation engineering may choose courses such as transportation planning, airport planning and design, railway planning and design, geometric highway design, or traffic engineering and pavement design.

Students interested in geotechnical engineering may choose courses in foundation engineering, earth slopes, and geosynthetics, earthquake engineering and advanced soil mechanics.

The curriculum includes a core of social humanistic subjects to provide the student with a background essential to a proper understanding of the role of engineering in society.

Students in Civil Engineering are strongly encouraged to participate in internships to enhance their classroom education with practical experience in engineering-related positions in industry.

Students transferring into Civil Engineering from other departments or institutions are encouraged to do so no later than the beginning of the junior year if they plan to complete the degree requirements within two academic years.

All Civil Engineering students at NDSU are required to have a minimum cumulative grade-point average of 2.0 for graduation and have received a grade of 'C' or better in the following courses and all prerequisites in sequence for these courses, before enrolling in any civil engineering courses that utilize these courses as prerequisites.

MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 128	Introduction to Linear Algebra	1
MATH 259	Multivariate Calculus	3
MATH 266	Introduction to Differential Equations	3
ME 221	Engineering Mechanics I	3
ME 222	Engineering Mechanics II	3
ME 223	Mechanics of Materials	3

Graduate programs leading to Master of Science and Doctor of Philosophy degrees are available in specialized fields. For more complete details, see the Graduate Bulletin (<http://bulletin.ndsu.edu/past-bulletin-archive/2015-16/graduate>) online.

## Major Requirements

### Major: Civil Engineering

**Degree Type: B.S.C.E.**

**Required Degree Credits to Graduate: 133**

### General Education Requirements

#### First Year Experience (F):

UNIV 189	Skills For Academic Success (Students transferring in 24 or more credits do not need to take UNIV 189.)	1
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#### Communication (C):

ENGL 110	College Composition I	3
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ENGL 120	College Composition II	3
ENGL 321	Writing in the Technical Professions	3
COMM 110	Fundamentals of Public Speaking	3
<b>Quantitative Reasoning (R):</b>		
MATH 165	Calculus I *	4
<b>Science &amp; Technology (S):</b>		
CHEM 121 & 121L	General Chemistry I and General Chemistry I Laboratory	4
CHEM 122	General Chemistry II	3
GEOL 105	Physical Geology	3
<b>Humanities &amp; Fine Arts (A):</b>		
ENGR 311	History of Technology in America	3
Select from current general education list		3
<b>Social &amp; Behavioral Sciences (B):</b>		
ENGR 312	Impact of Technology on Society	3
Select from current general education list		3
<b>Wellness (W): Select from current general education list</b>		2
<b>Cultural Diversity (D): Select from current general education list</b>		
<b>Global Perspectives (G):</b>		
GEOL 105	Physical Geology	3
<b>Total Credits</b>		<b>41</b>

## Major Requirements

<b>General Education Requirements</b>		40
<b>Civil Engineering Core Requirements</b>		
CE 111	Introduction to Civil Engineering	2
CE 204	Surveying	4
CE 212	Civil Engineering Graphic Communications	3
CE 303	Civil Engineering Materials	2
CE 303L	Civil Engineering Materials Laboratory	1
CE 309	Fluid Mechanics	3
CE 310	Fluid Mechanics Laboratory	1
CE 316	Soil Mechanics	3
CE 343	Structural Engineering and Analysis	4
CE 370	Introduction to Environmental Engineering	3
CE 371	Environmental Engineering Laboratory	1
CE 404	Reinforced Concrete	3
CE 408	Water Resources and Supply	3
CE 418	Transportation Engineering	4
CE 444	Structural Steel Design	3
CE 483	Contracts and Specifications	3
CE 489	Senior Design	3
<b>MATH Courses Required*:</b>		
MATH 128	Introduction to Linear Algebra	1
MATH 166	Calculus II	4
MATH 259	Multivariate Calculus	3
MATH 266	Introduction to Differential Equations	3
<b>Other Required Courses :</b>		
CHEM 122L	General Chemistry II Laboratory	1
ENGR 402	Engineering Ethics and Social Responsibility	1
IME 440	Engineering Economy	2
IME 460	Evaluation of Engineering Data	3

ME 221	Engineering Mechanics I *	3
ME 222	Engineering Mechanics II *	3
ME 223	Mechanics of Materials *	3
ME 350	Thermodynamics and Heat Transfer	3
PHYS 252	University Physics II	4

**Technical Electives Required: Select 12 credits from the following:** 12

**Structures:**

CE 411	Design of Pre-stressed Concrete (Design Credits 1.0)
CE 425	Bridge Evaluation and Rehabilitation (Design Credits 1.5)
CE 430	Timber and Form Design (Design Credits 1.5)
CE 441	Finite Element Analysis (Design Credits 1.0)
CE 445	Advanced Steel Design (Design Credits 1.0)
CE 446	Basic Dynamics of Structures (Design Credits 1.0)
CE 447	Stability of Structures (Design Credits 1.5)
CM&E 465	Bridge Engineering and Management (Design Credits 1.5)

**Water Resources:**

CE 421	Open Channel Flow (Design Credits 1.5)
CE 476	Watershed Modeling (Design Credits 1.5)
CE 477	Applied Hydrology (Design Credits 1.5)

**Environmental:**

CE 410	Water and Wastewater Engineering (Design Credits 1.5)
CE 471	Environmental Nanotechnology (Design Credits 1.5)
CE 472	Solid Waste Management (Design Credits 1.5)
CE 473	Air Pollution (Design Credits 1.5)
CE 478	Water Quality Management (Design Credits 1.5)
CE 479	Advanced Water and Wastewater Treatment (Design Credits 1.5)
CE 499	Special Topics (Design Credits 1.5)

**Transportation:**

CE 419	Pavement Design (Design Credits 1.5)
CE 454	Geometric Highway Design (Design Credits 2.0)
CE 455	Airport Planning and Design (Design Credits 1.0)
CE 456	Railroad Planning and Design (Design Credits 1.5)
CE 457	Pavement Management Systems (Design Credits 1.0)
CE 458	Bituminous Materials and Mix (Design Credits 1.5)
CE 499	Special Topics (Design Credits 1.0)

**Geotechnical:**

CE 417	Slope Stability and Retaining Walls (Design Credits 1.5)
CE 461	Foundation Engineering (Design Credits 1.0)
CE 462	Designing with Geosynthetics (Design Credits 1.0)
CE 463	Geotechnical Earthquake Engineering (Design Credits 1.5)
CE 464	Advanced Soil Mechanics (Design Credits 1.0)

**Advanced Materials:**

CE 486	Nanotechnology and Nanomaterials (Design Credits 0.0)
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**Total Credits**

**133**

\* No grades less than a "C" are accepted in any of the math courses, as well as ME 221 Engineering Mechanics I, ME 222 Engineering Mechanics II, and ME 223 Mechanics of Materials for this curriculum.

## Degree Requirements and Notes

- A student must complete at least 60 semester credits of professional level course work in his/her program while in residence and enrolled in the college. Students transferring into the college from programs with professional accreditation are exempt from this residency requirement but are subject to the residency requirement of NDSU.

- **Students must complete courses in a minimum of three technical areas with a minimum of 6 credits in design for a minimum total of 12 technical electives.**
- Transfer students are required to take ENGR 311 History of Technology in America or ENGR 312 Impact of Technology on Society regardless of General Education completion.

**Note:** Department permission required for graduate level courses. Credit may be earned only at the undergraduate level. Department permission is also required for some undergraduate courses. There are specific prerequisites and grade requirements to be allowed to take certain courses.