

# Civil Engineering

(A Division of the Mechanical Engineering Department)



Greg Roach, Department Chair  
Keith Bourgeois, Bill Cooley, Russell Daines, Nathan Harris,  
David Johnson, Jim Lawrence, Garth Miller

Kenna Carter, Department Secretary (208) 496-7630  
<http://www.byui.edu/mechanical-engineering>

## Civil Engineering

The program of Civil Engineering has one engineering program:

- 4-Year Bachelor of Science in Civil Engineering, BSCE (465)

The Bachelor of Science degree program in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

Using techniques, skills, and modern engineering modeling tools, students must demonstrate their abilities to apply mathematics, engineering science, and technology principles necessary for analyzing, modeling, and solving engineering problems. Students must communicate effectively in written and oral presentation. Each student must gain an understanding of professional and ethical behavior in the workplace. Finally, students who continue to develop a desire to enhance their abilities as a professional engineer and understand that learning is a life-long process, will be able to succeed in their careers.

The Civil Engineering program prepares students for professional careers in a wide range of areas including structures, water resources, environmental, transportation, and geotechnical engineering. Civil engineers are involved in a variety of activities such as the design and analysis of buildings, bridges, air frames, highways, airports, pipeline systems, dams, flood control structures, waste water treatment plants, retaining walls, and foundations.

The 4-year Bachelor of Science program in Civil Engineering (BSCE - 465) provides students with a solid foundation in mathematics, engineering science, solid mechanics, structural, geotechnical, transportation, and water resources engineering. In addition, students choose a focus area in computer aided engineering, engineering mechanics, environmental/water resources, geotechnical, material science, mining, petroleum, structural, transportation, or general engineering.

Students in the BSCE program are required to take the Fundamentals of Engineering (FE) exam before they graduate. This is an important milestone of achievement for each civil engineering student in preparing him/her for future licensing as a Professional Engineer. Students will also be required to pass a competency exam in order to register for any 300 and 400 level courses in civil engineering and mechanical engineering.

This program is designed to provide students with the competencies necessary to work in a variety of exciting fields within Civil Engineering. This program offers excellent placement potential, professional job satisfaction, and substantial salaries. Students entering this program can expect a well-designed and rigorous curriculum based on industry standards.

The bachelor of science program in Civil Engineering (465) is available to students entering Brigham Young University-Idaho on any admission track. Upper division courses require students to switch to the Fall/Winter track.

## Program Educational Objectives

Program Educational Objectives for the baccalaureate degree in Civil Engineering are to produce engineering graduates who:

1. Demonstrate and maintain faith in God, and exhibit high standards of personal integrity and professional ethics through lifelong service to family, church, profession, and community. [Service]
2. Provide leadership in their chosen field of endeavor through the application of effective interpersonal, communication, and teamwork skills. [Leadership]
3. Apply fundamental principles of design and analysis to develop innovative solutions in an industrial and societal context. [Design]
4. Maintain currency in their field through continued learning and education. [Lifelong Learning]

## Student Outcomes

To achieve the educational objectives, the following outcomes will be measured during the course of study within the BSCE program. Assessment methods consistent with accreditation recommendations will be used to determine how each student meets these outcomes.

The Civil Engineering program at BYU-Idaho is designed to give students the ability to:

1. Apply knowledge of fundamental math, science, and engineering principles. (Fundamentals)
2. Design and conduct experiments and analyze the resulting data. (Experiments)
3. Design components, systems, or processes necessary to meet product specifications and design constraints. (Engineering Design)
4. Function well within a multidisciplinary team. (Team Work)
5. Identify, formulate, and solve engineering problems. (Model & Solve)
6. Maintain high ethical, moral, and professional standards. (Ethics)
7. Communicate effectively in both oral and written format. (Communication)
8. Understand the impact engineering has on the world. (Global Impact)
9. Recognize the need for, and engage in life-long learning. (Continued Learning)
10. Understand contemporary issues. (Contemporary Issues)
11. Use the techniques, skills, and modern engineering tools necessary for engineering practice. (Engineering Tools)

## Civil Engineering

Brigham Young University-Idaho 2016-2017

12. Apply knowledge in environmental, geotechnical, structural, transportation, and water resources engineering. (Technical Breadth)
13. Explain basic concepts in management, business, public policy, leadership, and the importance of professional licensure. (Professional Breadth)

### General Information

Mathematics and physical sciences are critical components of any engineering curriculum. The normal entry-level mathematics class for the civil engineering program is Calculus (FDMAT 112). Entering freshman students should consult with their advisor to ensure they are beginning with the mathematics course for which they are prepared. Students with weak mathematics skills are advised to enroll in a preparatory mathematics course to strengthen their skills.

It is imperative that students develop and follow a plan of study that will allow them to complete all the required courses within the credit hour limits. Students should consult with their advisor/mentor early to make sure their educational plan is correct. Sample curriculum flow charts can be found at <http://www2.byui.edu/MechEngr/>

BS in Civil Engineering (465)				
<b>Entry Courses</b> <i>Take these courses your first 2 semesters:</i> ME 101           1 ME 142           3 ME 172           3 <hr style="width: 50px; margin-left: 0;"/> 7	<i>Complete a 12-credit emphasis from the following list:</i>			<b>Program Notes:</b>  •No Double Counting of Major Courses  •Students must maintain a minimum grade of C- in their major courses.  • <b>COMPETENCY EXAM</b> Students must complete the Mechanical Engineering Competency Exam.  • <b>FE EXAM</b> Students must take the FE Exam prior to graduation.  •*Per discussion with applicable departments, CE core satisfies other imbedded prerequisites.  •**See list of specific Foundations courses for Civil Engineering in this section of the catalog.
<b>Core Courses</b> <i>Take these courses:</i> CE 321           3 CE 341           3 CE 351           3 CE 361           3 CE 424           3 CE 433           3 CE 470           3 CONST 340      3 MATH 215       4 MATH 316       4 MATH 330       4 ME 201           3 ME 202           3 ME 204           3 ME 250           3 ME 250L        1 ME 360           3 PH 123           3 <hr style="width: 50px; margin-left: 0;"/> 54	<b>Computer Aided Engineering</b> <i>Take these courses:</i> ME 342           3 ME 425           3 ME 438           3 ME 460           3	<b>Material Science</b> <i>Take 6 credits:</i> CHEM 106        4 CHEM 220        5 CHEM 351        4 CHEM 352        4 CHEM 461        3 CHEM 462        3 <i>Take 6 credits:</i> ME 322           3 ME 445           3 ME 460           3 PH 220           3  <b>*Mining Engineering</b> <i>Take these courses:</i> CE 441           3 ME 465           3 <i>Take 6 credits:</i> GEOL 111        3 GEOL 111L      1 GEOL 341        1 GEOL 351        3 GEOL 352        3  <b>*Petroleum Engineering</b> <i>Take these courses:</i> CE 441           3 ME 465           3 <i>Take 6 credits:</i> GEOL 111        3 GEOL 111L      1 GEOL 340        3 GEOL 341        1 GEOL 370        4 GEOL 404        3 GEOL 425        3 GEOL 435        3	<b>Structural</b> <i>Take these courses:</i> CE 421           3 ME 460           3 <i>Take 6 credits:</i> CE 441           3 MATH 411        3 ME 342           3 ME 445           3  <b>Transportation</b> <i>Take these courses:</i> CE 461           3 ME 342           3 <i>Take 6 credits:</i> GEOL 340        3 MATH 423        3 POLSC 330       3  <b>General</b> <i>Take 12 credits:</i> CE 370           3 CE 421           3 CE 441           3 CE 461           3 CIT 380          3 GEOL 340        3 ME 337           3 ME 342           3 ME 370           3 ME 410           3 ME 425           3 ME 438           3 ME 445           3 ME 460           3 ME 465           3 ME 495R          3	
<i>Complete 1 option:</i> GEOL 111        3 GEOL 111L      1 or BIO 221          3 <hr style="width: 50px; margin-left: 0;"/> 3	<b>*Environmental/Water Resources</b> <i>Take these courses:</i> CE 370           3 ME 322           3 <i>Take 6 credits:</i> GEOL 111        3 GEOL 111L      1 GEOL 340        3 GEOL 341        1 GEOL 404        3 GEOL 435        3  <b>*Geotechnical</b> <i>Take these courses:</i> CE 441           3 ME 460           3 <i>Take 6 credits:</i> GEOL 111        3 GEOL 111L      1 GEOL 340        3 GEOL 341        1 GEOL 351        3 GEOL 404        3	<b>Experiential Learning</b> <i>Take 1 credit:</i> ME 299           1 ME 398R          1 ME 490R          1 <hr style="width: 50px; margin-left: 0;"/> 1		
<b>Credit Requirements:</b>  Foundations       42 Major               77 Elective            1 Total               120		<b>Tracks Available:</b>  Fall-Winter        Yes Winter-Spring     Yes Spring-Fall        Yes		

## Foundations Requirements for BS in Civil Engineering

Eternal Truths		Academic Fundamentals		Cultural Awareness
<b>Cornerstone Courses</b> <i>Take these courses:</i>	<b>Other Religion Courses</b> <i>Take 6 credits:</i>	<b>Reading, Writing, &amp; Critical Thinking</b> <i>Take this course:</i>	<b>Quantitative Reasoning</b> <i>Complete 1 option:</i>	<b>American Foundations</b> <i>Take 1 course:</i>
FDREL 200           2	FDREL 100           2	FDENG 101           3	<i>Option A</i>	FDAMF 101           3
FDREL 225           2	FDREL 130           2		FDMAT 112           4	FDCIV 101           3
FDREL 250           2	FDREL 190           1-3			
FDREL 275           2	FDREL 211           2		<i>Option B</i>	
8	FDREL 212           2	<b>Advanced Research</b>	MATH 109 and       5	<b>Humanities, International, Literature &amp; World</b>
	FDREL 215           2	<b>Writing</b>	FDMAT 112           4	<i>Take 1 course:</i>
	FDREL 234           2	<i>Take either:</i>		FDHUM 110           3
	FDREL 235           2	FDENG 301           3	<i>Option C</i>	FDWLD 101           3
	FDREL 261           2	OR	FDMAT 110 and       3	
	FDREL 301           2	<i>Take 1 course from the following list:</i>	MATH 111 and       2	
	FDREL 302           2	GEOL 316           3	FDMAT 112           4	<i>Take 1 course:</i>
	FDREL 324           2	B 320               3		FDHUM 214           3
	FDREL 325           2	HUM 305           3	<b>Science Foundations</b>	FDHUM 299           3
	FDREL 327           2		<i>Take this course:</i>	FDINT 211           3
	FDREL 333           2		FDSOI 101           2	FDINT 212           3
	FDREL 341           2			FDINT 215           3
	FDREL 342           3		<b>Issues in the Sciences</b>	FDINT 299           3
	FDREL 343           3		<i>Take these courses:</i>	FDLIT 216           3
	FDREL 345           2		CHEM 105           4	FDLIT 299           3
	FDREL 351           2		PH 121               3	FDWLD 201           3
	FDREL 352           2			
	FDREL 390R          2			
	FDREL 397           2			
	FDREL 404           2			
	FDREL 431           2			
	FDREL 471           2			
	FDREL 475           2			
	6			<b>Credits:</b> 42

### Course Descriptions

### Credits\*

#### CE 321 Structural Analysis

(3:3:0:0)

Prerequisites: ME 142 and ME 202

Corequisite: MATH 316

Deflection analysis by the method of virtual work. Analysis of statically indeterminate structures by the flexibility method, the stiffness method, and moment distribution.

Computer analysis of structures.

(Fall)

#### CE 341 Elementary Soil Mechanics

(3:2:2:0)

Prerequisite: ME 202

Determination of stresses in soils, soil strength, consolidation, and settlement. Applications in fluid flow, lateral earth pressure, bearing pressure, and slope stability.

(Winter)

#### CE 351 Environmental Engineering

(3:3:0:0)

Prerequisites: CHEM 105 and MATH 330

Environmental concerns, problems, and evaluation methodology; pollution control and engineering management approaches.

(Winter)

#### CE 361 Introduction to Transportation Engineering

(3:3:2:0)

Prerequisites: ME 142 and ME 172 and CONST 340

Corequisite: MATH 330

Transportation system characteristics, traffic engineering, traffic operations, transportation planning, highway geometric design, pavement design, highway safety, and public transport.

(Fall)

#### CE 370 Hydrology

(3:2:2:0)

Prerequisites: MATH 330 and ME 360

Explores the principles and processes governing the movement of water through the hydrologic cycle. Hydrologic statistics and frequency analysis techniques supplemented with current software will be applied to problems of engineering hydrologic design.

(Fall)

#### CE 421 Structural Steel Design

(3:3:0:0)

Prerequisites: ME 250 and CE 321

Analysis and design of structural steel tension members, columns, beams, moment frames, simple connections and moment connections per the AISC design code. Emphasis on LRFD. Structural loads and material properties also considered.

(Winter)

#### CE 424 Reinforced Concrete Design

(3:3:0:0)

Prerequisites: ME 250 and CE 321 and CE 341

Theory and design of reinforced concrete, including columns, beams, slabs, and footings; elastic and ultimate-strength methods of analysis.

(Fall)

#### CE 433 Hydraulic Engineering

(3:3:0:0)

Prerequisites: ME 360 and CE 351

Application of fluid mechanic principles to analyze and design hydraulic structures and systems.

(Fall)

#### CE 441 Geotechnical Engineering Design

(3:3:0:0)

Prerequisite: CE 341

Application of principles and theories learned in soil mechanics. Evaluation of slope stability. Design consideration for various foundations, including shallow foundations, piles, drilled-shafts, and retaining walls.

(Fall)

#### CE 461 Geometric Design of Highways

(3:2:2:0)

Prerequisite: CE 361

Design of highway systems including classification, design criteria and controls, horizontal and vertical alignment, cross-sections, clear zone, signing and striping, and capacity.

(Winter)

#### CE 470 Civil Engineering Practice and Design

(3:2:2:0)

Prerequisites: CE 424 and CE 433

Engineering economic analysis, professional practice issues, and experience in completion of a civil engineering design project by applying appropriate engineering standards and multiple realistic constraints.

(Winter)

#### ME Competency Exam- Fundamentals of Engineering Competency 1

Competency Exam required of all Mechanical and Civil Engineering majors prior to taking upper division engineering classes. Topics on the exam include statics (ME 201), mechanics of materials (ME 202), and dynamics (ME 204). Students should wait until they have completed these courses before they take the exam. The exam is offered the 1st, 9th, and 11th week of each semester.

(Fall, Winter, Spring)

#### FE Exam- Fundamentals of Engineering Exam

FE Exam is required for all CE majors. This exam must be taken during the final two semesters.