



**BS in CIVIL ENGINEERING (392850) MAP Sheet**  
 Department of Civil and Environmental Engineering  
 For students entering the degree program during the 2013–2014 curricular year.

UNIVERSITY CORE AND GRADUATION REQUIREMENTS				PROGRAM REQUIREMENTS (94–97 total hours)			
<b>UNIVERSITY CORE REQUIREMENTS</b>				<b>Complete the following courses:</b>			
<b>Requirements</b>	<b># Classes</b>	<b>Hours</b>	<b>Classes</b>	CE En 100A Civil & Environmental Engineering Seminar	0.5	<b>Complete one of the following options:</b>	
				CE En 100B Civil & Environmental Engineering Seminar	0.5	<b>Either</b>	
				CE En 101 Intro to Civil Engineering	1.0	Math 302 Mathematics for Engineering 1	4.0
				CE En 103 Engineering Mechanics—Statics	3.0	Math 303 Mathematics for Engineering 2	4.0
<b>Doctrinal Foundation</b>				CE En 112 Engineering Drafting w/CAD Applications	3.0	<b>Or</b>	
Book of Mormon	2	4.0	Rel A 121/H and 122/H	CE En 113 Engineering Measurements	3.0	Math 313 Elementary Linear Algebra	3.0
New Testament	1	2.0	Rel A 211/H or 212/H	CE En 200A Civil & Environmental Engineering Seminar	0.5	Math 314 Calculus of Several Variables	3.0
Doctrine and Covenants	1	2.0	Rel C 324/H or 325/H	CE En 200B Civil & Environmental Engineering Seminar	0.5	Math 334 Ordinary Differential Equations	3.0
<b>The Individual and Society</b>				CE En 203 Engr Mechanics— Mechanics of Materials	3.0	<b>Complete the following supporting courses:</b>	
Citizenship				CE En 204* Engineering Mechanics—Dynamics	3.0	Chem 105 General College Chemistry	4.0
American Heritage	1–2	3–6.0	from approved list	CE En 270 Computational Methods	3.0	Engl 316* Technical Communication	3.0
Global & Cultural Awareness	1	3.0	Eng T 231*	CE En 300A Civil & Environmental Engineering Seminar	0.5	Eng T 231* Foundations of Global Leadership	3.0
<b>Skills</b>				CE En 300B Civil & Environmental Engineering Seminar	0.5	Geol 330 Geology for Engineers	3.0
Effective Communication				CE En 304 CE Materials: Metals, Woods, Composites	1.5	Math 112* Calculus 1	4.0
First-Year Writing	1	3.0	from approved list	CE En 306 CE Materials: Concrete, Masonry, Asphalt	1.5	Math 113* Calculus 2	4.0
Adv Written & Oral Communication	1	3.0	Engl 316*	CE En 321 Structural Analysis	3.0	Phscs 123 Principles of Physics 2	3.0
Quantitative Reasoning	0–1	0–4.0	Math 112*, 113* or Stat 201*	CE En 332 Hydraulics and Fluid Flow Theory	3.0	Stat 201* Statistics for Engineers & Scientists	3.0
Languages of Learning (Math or Language)	1	4.0	Math 112*, 113* or Stat 201*	CE En 341 Elementary Soil Mechanics	3.0	<b>Complete 4 technical elective courses from the following courses:</b>	
<b>Arts, Letters, and Sciences</b>				CE En 351 Environmental Engineering	3.0	CE En 414 Engineering Applications of GIS	3.0
Civilization 1 and 2	2	6.0	from approved list	CE En 361 Introduction to Transportation Engineering	3.0	CE En 421 Structural Steel Design	3.0
Arts	1	3.0	from approved list	CE En 400A Civil & Environmental Engineering Seminar	0.5	<b>OR</b> Ce En 424 Reinforced Concrete Design	3.0
Letters	1	3.0	from approved list	CE En 400B Civil & Environmental Engineering Seminar	0.5	CE En 427 International Megastructures	3.0
Scientific Principles & Reasoning				<b>Note:</b> Students must be enrolled in seminar each semester from the time the major is declared until graduation, beginning with 100A/B and continuing through 400A/B. Transfer students, or students joining the major from another department, should start with 100 A/B and then see the Dept. Undergraduate Advisor for future placement.		CE En 431 Hydrology	3.0
Biological Science	1	3.0	from approved list			<b>OR</b> CE En 433 Hydraulic Engineering	3.0
Physical Science	1	3.0	CE En 204*			CE En 439 Latin Am. Study Abroad in Water Resources	3.0
Social Science	1	3.0	Eng T 231*			CE En 461 Geometric Design of Highways	3.0
<b>Core Enrichment: Electives</b>				<b>Complete one course from the following:</b>		CE En 472 Civil Engineering Design	3.0
Religion Electives	3–4	6.0	from approved list	CE En 421 Structural Steel Design	3.0	CE En 500 Design and Materials Applications	3.0
Open Electives	Variable	Variable	personal choice	CE En 424 Reinforced Concrete Design	3.0	CE En 501 Stress Analysis & Design of Mechanical Structures	3.0
<b>GRADUATION REQUIREMENTS:</b>				<b>Complete one course from the following:</b>		CE En 503 Plasticity and Fracture	3.0
Minimum residence hours required		30.0		CE En 431 Hydrology	3.0	CE En 504 Computer Structural Analysis and Optimization	3.0
Minimum hours needed to graduate		120.0		CE En 433 Hydraulic Engineering	3.0	CE En 505 Portland Cement Concrete Mixture Design 3.0 and Analysis	
				<b>Complete one course from the following:</b>		CE En 506 Continuum Mechanics & Finite Elements	3.0
				CE En 471A Civil Engineering Practice	1.0	CE En 508 Structural Vibrations	3.0
				CE En 471B Civil Engineering Practice	1.0	CE En 521 Seismic-Resistant Steel Buildings	3.0
						CE En 523 Aircraft Structures	3.0
						CE En 525 Bridge Structures	3.0

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**Suggested Sequence of Courses:**

CE En 528	Masonry Design	3.0
CE En 529	Timber Design	3.0
CE En 531	Principles of Hydrologic Modeling	3.0
CE En 535	Hydraulic Design of Channels & Control Structures	3.0
CE En 540	Geo-Environmental Engineering	3.0
CE En 542	Foundation Engineering	3.0
CE En 544	Seepage & Slope Stability Analysis	3.0
CE En 545	Geotechnical Analysis of Earthquake Phenomena	3.0
CE En 547	Groundwater Modeling	3.0
CE En 551	Water Treatment Facilities Design	3.0
CE En 555	Environmental Chemistry	3.0
CE En 562	Traffic Engineering: Characteristics & Operations	3.0
CE En 563	Pavement Design	3.0
CE En 565	Urban Transportation Planning	3.0
CE En 570	Computer-Aided Engr Software Development	3.0
CE En 572	Computer-Aided Geometric Design	3.0
CE En 575	Optimization Techniques in Engineering	3.0
CE En 594R	Selected Prob. in Civil & Environmental Engineering	3.0V

**Note:** At least 1 of the 4 technical elective courses must be a culminating design experience:  
CE en 427, 439, 472, 540, 563

**Note:** 1 of the 4 technical elective courses may come from:  
Eng T 497R.  
Me En 321.

**Note:** Only three credit hours of approved Study Abroad courses may be used to fill the technical electives.

**FRESHMAN YEAR**

<u>1st Semester</u>	
First-Year Writing or A Htg	3.0
Bio 100	3.0
CE En 100A (F)	0.5
CE En 112 (FW)	3.0
Math 112 (FWSpSu)	4.0
Rel A 121 (FWSpSu)	2.0
<b>Total Hours</b>	<b>15.5</b>

2nd Semester

First-Year Writing or A Htg	3.0
CE En 100B (W)	0.5
CE En 101 (FW)	1.0
CE En 103 (FWSp)	2.0
Eng T 231 (FW)	3.0
Math 113 (FWSpSu)	4.0
Rel A 122 (FWSpSu)	2.0
<b>Total Hours</b>	<b>16.5</b>

**SOPHOMORE YEAR**

<u>3rd Semester</u>	
CE En 113 (Fsp)	3.0
CE En 200A (F)	0.5
CE En 203 (FWSu)	3.0
Chem 105 (FWSpSu)	4.0
Math 302 (FWSpSu)	4.0
Rel 211 or 212 (FWSpSu)	2.0
<b>Total Hours</b>	<b>16.5</b>

4th Semester

CE En 200B (W)	0.5
CE En 204 (FWSu)	3.0
CE En 270 (FW)	3.0
CE En 351	3.0
Math 303 (FWSu)	4.0
Stat 201	3.0
<b>Total Hours</b>	<b>16.5</b>

**JUNIOR YEAR**

<u>5th Semester</u>	
CE En 300A (F)	0.5
CE En 304 (FW)	1.5
CE En 306 (FW)	1.5
CE En 332 (FW)	3.0
CE En 361 (FSp)	3.0
Engl 316	3.0
Rel C 324 or 325 (FWSpSu)	2.0
<b>Total Hours</b>	<b>14.5</b>

<u>6th Semester</u>	
CE En 300B (W)	0.5
CE En 321 (FW)	3.0
CE En 341 (FW)	3.0
Geol 330 (FW)	3.0
Letters elective	3.0
Religion elective	2.0
Religion elective (Rel C 351 recomm.)	2.0
<b>Total Hours</b>	<b>16.5</b>

**SENIOR YEAR**

<u>7th Semester</u>	
CE En 400A (FW)	0.5
CE En 424 (FSp) or 421 (W)	3.0
CE En 471 (FW)	1.0
Civilization 1 elective	3.0
Phscs 123	3.0
Religion elective	2.0
Technical elective	3.0
<b>Total Hours</b>	<b>15.5</b>

8th Semester

CE En 400B (FW)	0.5
CE En 431 (FSp) or 433 (WSu)	3.0
Civilization 2/Arts elective	3.0
Technical elective	3.0
Technical elective	3.0
Technical elective	3.0
<b>Total Hours</b>	<b>15.5</b>

**Note:** Students are encouraged to complete an average of 16 credit hours each semester or 32 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the cost and the number of semesters to graduate.

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## BS in CIVIL ENGINEERING (392850) 2013–2014

### THE DISCIPLINE

The BYU Department of Civil and Environmental Engineering prepares students for professional involvement in structural, water resources, environmental, geotechnical (soils), and transportation engineering.

Structural engineers analyze and design buildings, bridges, and other structures. The engineer applies principles of physics, mathematics, and engineering to develop efficient yet safe designs. Sophisticated computer models are used in these analyses. Materials used by structural engineers include steel, aluminum, masonry, wood, and composites.

Water resource and environmental engineers design pipeline systems, water treatment plants, dams, flood control structures, waste disposal sites, and environmental restoration projects. Computer modeling and analyses are used in design and to forecast storm runoff, flooding, and movement of contaminants in surface and subsurface waters. Environmental engineers evaluate and reduce pollutants from natural, human, agricultural, and industrial sources to preserve the beauty and quality of air, land, and water.

Geotechnical engineers design structures composed of or located within earth materials, including foundations for buildings and bridges, retaining walls, earth dams, highway embankments, tunnels, and liners for landfills. Field and laboratory tests on soil and rock along with empirical and computer models are used to assure safety and economy in design.

Traffic and transportation engineers apply scientific principles to the planning, design, construction, operation, and management of transportation systems, including highways, airports, and mass transit facilities. Transportation engineers are responsible for the safe, rapid, comfortable, convenient, economical, and environmentally compatible movement of people and goods. Computer models and simulations are used by traffic engineers for geometric design and for planning, operating, and managing transportation networks, including intermodal systems.

### STUDENT CHAPTER

The BYU Department of Civil and Environmental Engineering Student Chapter of the American Society of Civil Engineers is one of the nation's most active and successful chapters. The Chapter has received the Ridgway Award as the nation's top chapter five times. Through participation in the chapter, students have an opportunity to learn about the broad spectrum of civil engineering opportunities. They may also participate in chapter community service projects, which include the construction of bridges, parks, and other aids to communities in the area.

### FINANCIAL ASSISTANCE

In addition to university scholarships, the department awards many part-tuition scholarships, largely to upper division and graduate students. Many teaching and research assistantships are available in the department largely to upper division and graduate students.

### AWARDS

The department has the following privately endowed awards: the Russell J. Berrett Scholarship, the Joseph Layne Black Scholarship, the W Don and Kaye Budge ASCE Scholarship, the Caleb Tanner Water Resources Scholarship, the Jerry Christiansen Scholarship, the Nancy and Doug Ferrell Scholarship, the D Allan Firmage Scholarship, the Dean K Fuhriman Scholarship, the King and Diane Husein Professorship, the Ramesh and Marian Khona Scholarship, the Marvin E Larson Scholarship, the Pavement and Materials Endowed Mentorship, the Billy and Marian Nichols Scholarship, the H Burke Peterson Scholarship, the Ralph and Betty Rollins Scholarship, the John and Bobbie Tanner Scholarship, the Lee and Connie Wimmer Scholarship, and the T Leslie Youd Family Fellowship. In addition, the department has the following private annual awards: the ES<sup>2</sup> Scholarship, the GeoEngineers Scholarship, the Keller and Associates Scholarship, the Wayne Y Lee Scholarship, the Wright Engineers Scholarship, the D Allan Firmage Undergraduate Scholarship, the Earl and Beth Hurst Scholarship, the BES CE Class of 1967 Scholarship, and the URS Corporation Scholarship. Applications are available in January.

### CAREERS

Civil engineers are employed in industry, private consulting, and government. Industries employing many civil and environmental engineers include construction, transportation, aerospace, petroleum, and mining. Many civil engineers enter private consulting practices, and many eventually establish their own firms.

Civil engineers are also employed by national, state, and local governments. Most cities and counties have engineering departments staffed largely by civil engineers. Departments of transportation, environmental protection agencies, the Army Corps of Engineers, and the Bureau of Reclamation hire many civil engineers.

Civil engineering may be used as a preprofessional program for careers in architecture, law, and business.

### PROFESSIONAL ENGINEERING REGISTRATION

Because civil engineers design structures that affect public health and safety, licensure as a Professional Engineer is required for most positions. A necessary prerequisite for licensure is graduation from an accredited engineering program. The civil engineering program is fully accredited by the Accreditation Board for Engineering and Technology (ABET).

During the senior year, students are encouraged to take the Fundamentals of Engineering Exam. This exam is the first step in registration as a Professional Engineer, a mark of competence and professional stature.

### MAIN SUBDISCIPLINE AREAS

*Structures:* Includes structural design of buildings and bridges, seismic design of structures, fiber-reinforced polymer composite structures, aircraft structures, structural optimization, and numerical methods for structural analysis.

*Water resources and environmental:* Includes industrial and hazardous waste control, hazardous waste site remediation, water and wastewater treatment, water quality management, computer-base analyses and design of water and wastewater systems, satellite hydrology, and hydraulic structures and systems.

*Geotechnical :* Includes soils as engineered systems, foundation and embankments, ground response to earthquakes, liquefaction, collapsible soils, and soil improvement techniques.

*Transportation:* Includes transportation systems and planning, geometric highway design, traffic operations and safety, highway materials, and pavement design.

### CO-OP AND PRACTICAL EDUCATION

Students may participate in employment related to the major through the university Co-op program. Civil and environmental engineering is practice-oriented. Practical examples and case studies are commonly used in classes, particularly in upper division courses. Many field trips to functioning or under-construction engineering facilities are provided.