BS in Civil Engineering (392850) MAP Sheet
Engineering, Civil and Environmental Engineering
For students entering the degree program during the 2020-2021 curricular year.

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FOR UNIVERSITY CORE QUESTIONS CONTACT THE ENGINEERING COLLEGE ADMISSION CENTER — FOR PROGRAM QUESTIONS SEE THE CE EN DEPARTMENT ACADEMIC ADVISOR.

*THESE COURSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (16-20 hours overlap)

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.
Review records with department a minimum of one year before anticipated graduation date. No more than 9 credit hours of grades below C - in major courses may be applied toward graduation.

**REQUIREMENT 1 Complete 20 courses**
CE EN 101 - Introduction to Civil and Environmental Engineering 1.0
CE EN 103 - Engineering Mechanics - Statics 3.0
CE EN 112 - Engineering Drafting with CAD Applications 3.0
CE EN 170 - Computational Methods 3.0
CE EN 200A - Civil and Environmental Engineering Seminar 0.5
CE EN 200B - Civil and Environmental Engineering Seminar 0.5
CE EN 201 - Sustainable Infrastructure 2.0
CE EN 204 - Engineering Mechanics - Dynamics 3.0
CE EN 214 - Geomatics 2.0
CE EN 300A - Civil and Environmental Engineering Seminar 0.5
CE EN 300B - Civil and Environmental Engineering Seminar 0.5
CE EN 304 - Civil Engineering Materials: Metals, Woods, and Composites 1.5
CE EN 306 - Civil Engineering Materials: Concrete, Masonry, and Asphalt 1.5
CE EN 321 - Structural Analysis 3.0
CE EN 332 - Hydraulics and Fluid Flow Theory 3.0
CE EN 341 - Elementary Soil Mechanics 3.0
CE EN 361 - Introduction to Transportation Engineering 3.0
CE EN 400A - Civil and Environmental Engineering Seminar 0.5
CE EN 400B - Civil and Environmental Engineering Seminar 0.5

Students are to enroll in seminar each Fall/Winter semester once declared in the CEEN major, starting with 200A/B, then meet with the department academic advisor for future placement.

**REQUIREMENT 2 Complete 4 courses**
CE EN 471A - Civil Engineering Practice 1.0
CE EN 471B - Civil Engineering Practice 1.0

**REQUIREMENT 3 Complete 1 option**
**OPTION 3.1 Complete 2 courses**
MATH 302 - Mathematics for Engineering 1 4.0
MATH 303 - Mathematics for Engineering 2 4.0

**OPTION 3.2 Complete 2 groups**
**GROUP 3.2.1 Complete 1 selection**
- **SELECTION 3.2.1.1 Complete 1 course**
  MATH 213 - (Not currently offered)
- **SELECTION 3.2.1.2 Complete 2 courses**
  MATH 213 - Elementary Linear Algebra 2.0

**MATH 215 - Computational Linear Algebra 1.0**

**GROUP 3.2.2 Complete 2 courses**
MATH 314 - Calculus of Several Variables 3.0
MATH 334 - Ordinary Differential Equations 3.0

**REQUIREMENT 4 Complete 7 courses**

**SUPPORTING COURSES:**
CHEM 105 - General College Chemistry 1 with Lab (Integrated) 4.0
GEOL 330 - Geology for Engineers 3.0
*MATH 112 - Calculus 1 4.0
MATH 113 - Calculus 2 4.0
*PHSCS 121 - Introduction to Newtonian Mechanics 3.0
STAT 201 - Statistics for Engineers and Scientists 3.0
*WRTG 116 - Technical Communication 3.0

**REQUIREMENT 5 Complete 1 course**
*CE EN 231 - Foundations of Global Leadership 3.0
ENG T 231 - (Not currently offered)

**REQUIREMENT 6 Complete 1 course**

**CULMINATING DESIGN COURSES (TECHNICAL ELECTIVE):**
CE EN 439 - Water Resources Study Abroad 3.0
CE EN 472 - Civil Engineering Design 3.0
CE EN 400A - Civil and Environmental Engineering Seminar 0.5
CE EN 400B - Civil and Environmental Engineering Seminar 0.5

**REQUIREMENT 7 Complete 12.0 hours from the following course(s)**

**TECHNICAL ELECTIVES: COMPLETE 4 ADDITIONAL TECHNICAL ELECTIVE COURSES FROM THE FOLLOWING (NOTE: A COURSE TAKEN AS A MAJOR REQUIREMENT COURSE MAY NOT DOUBLE COUNT AS A TECHNICAL ELECTIVE COURSE):**
CE EN 414 - Engineering Applications of GIS 3.0
CE EN 421 - Structural Steel Design 3.0
CE EN 424 - Reinforced Concrete Design 3.0
CE EN 431 - Hydrology 3.0
CE EN 433 - Hydraulic Engineering 3.0
CE EN 439 - Water Resources Study Abroad 3.0
CE EN 442 - Foundation Engineering 3.0
CE EN 451 - Environmental Engineering Processes 3.0
CE EN 461 - Geometric Design of Highways 3.0
CE EN 472 - Civil Engineering Design 3.0
CE EN 495R - Global Engineering Outreach Projects 3.0
CE EN 500 - (CE En-Me En) Design and Materials Applications 3.0
CE EN 501 - (CE En-Me En) Stress Analysis and Design of Mechanical Structures 3.0
CE EN 503 - (CE En-Me En) Plasticity and Fracture 3.0
CE EN 504 - (CE En-Me En) Computer Structural Analysis and Optimization 3.0
CE EN 505 - Portland Cement Concrete Mixture Design and Analysis 3.0
CE EN 507 - (CE En-Me En) Linear Finite Element Methods 3.0

**CE EN 588 - (CE En-Me En) Structural Vibrations 3.0**
CE EN 514 - Geospatial Environmental Engineering 3.0
CE EN 521 - Advanced Structural Steel Design 3.0
CE EN 523 - (CE En-Me En) Aircraft Structures 3.0
CE EN 525 - Bridge Structures 3.0
CE EN 526 - Bridge Preservation 1.5
CE EN 528 - Masonry Design 3.0
CE EN 529 - Structural Wood Design 3.0
CE EN 531 - Principles of Hydrologic Modeling 3.0
CE EN 533 - Advanced Hydraulic Routing 3.0
CE EN 534 - Hydroinformatics 3.0
CE EN 535 - Hydraulic Design of Channels and Control Structures 3.0
CE EN 540 - Geo-Environmental Engineering 3.0
CE EN 542 - Deep Foundations and Retaining Systems 3.0
CE EN 543 - Chemical Stabilization of Soils 1.5
CE EN 544 - Seepage and 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 and Operations 3.0
CE EN 563 - Pavement Design 3.0
CE EN 565 - Urban Transportation Planning 3.0
CE EN 566 - Pavement Management 3.0
CE EN 568 - Asphalt Mixture Design and Analysis 1.5
CE EN 570 - (CE En-Me En) Computer-Aided Engineering Software Development 3.0
CE EN 572 - Computer-Aided Geometric Design 3.0
CE EN 575 - (CE En-Me En) Optimization Techniques in Engineering 3.0
CE EN 580 - Technical Writing for Publication 1.5
CE EN 594R - Selected Problems in Civil and Environmental Engineering 3.0

You may take up to 9 credit hours.

**REQUIREMENT 8 Complete 2 options**
**OPTION 8.1 Complete 1 course**
CE EN 421 - Structural Steel Design 3.0
CE EN 424 - Reinforced Concrete Design 3.0

**OPTION 8.2 Complete 1 course**
CE EN 431 - Hydrology 3.0
CE EN 433 - Hydraulic Engineering 3.0

**OPTION 8.3 Complete 1 course**
CE EN 442 - Foundation Engineering 3.0

**OPTION 8.4 Complete 1 course**
CE EN 461 - Geometric Design of Highways 3.0
### 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, concrete, masonry, wood, and composites. Water resources 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, railroads, 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 8 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. Besides the well-established BYU ASCE Student Chapter, the department has two transportation focused student chapters: The BYU Institute of Transportation Engineers (ITE) Student Chapter and the BYU American Railway Engineering and Maintenance-of-Way Association (AREMA) Student Chapter. Through the activities of these two chapters, students are able to meet with professional engineers and their potential future employers in their monthly meetings, associate with students who have the same career goals, learn from invited speakers and have opportunities to do service projects in the community.

### FINANCIAL ASSISTANCE:
In addition to university scholarships, the department awards many part-tuition scholarships, largely to upper division and graduate students. To apply, visit ceen.byu.edu/scholarships. Teaching and research assistantships are available in the department, largely for upperdivision and graduate students.

### 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 BYU Civil Engineering program is currently accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org/.

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, fiberreinforced 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-based analyses and design of water and wastewater systems, satellite hydrology, hydroinformatics, 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.

### MAP DISCLAIMER
While every reasonable effort is made to ensure accuracy, there are some student populations that could have exceptions to listed requirements. Please refer to the university catalog and your college advisement center/department for complete guidelines.
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2020-2021