CIVIL ENGINEERING UNDERGRADUATE MAJOR

COVID-19-Related Degree Requirement Changes

For information on how Civil Engineering degree requirements have been affected by the pandemic, see the "COVID-19 Policies tab (http://exploredegrees.stanford.edu/schoolofengineering/civilandenvironmentalengineering/#covid19policiestext)" in the "Civil and Environmental Engineering" of this bulletin. For University-wide policy changes related to the pandemic, see the "COVID-19 and Academic Continuity (http://exploredegrees.stanford.edu/covid-19-policy-changes/)" section of this bulletin.

See the "Department of Civil and Environmental Engineering (http://exploredegrees.stanford.edu/schoolofengineering/civilandenvironmentalengineering/)" section of this bulletin for additional information on the department, and its programs and faculty.

The department offers a B.S. as well as a minor in Civil Engineering (see following), as well as a B.S. in Environmental Systems Engineering (http://exploredegrees.stanford.edu/soe-ug-majors/ese/) and a minor in Environmental Systems Engineering (http://exploredegrees.stanford.edu/schoolofengineering/civilandenvironmentalengineering/#minortext).

Civil Engineering (CE)

Completion of the undergraduate program in Civil Engineering leads to the conferral of the Bachelor of Science in Civil Engineering.

Mission of the Undergraduate Program in Civil Engineering

The mission of the undergraduate program in Civil Engineering is to provide students with the principles of engineering and the methodologies necessary for civil engineering practice. This pre-professional program balances the fundamentals common to many specialties in civil engineering and allows for concentration in any of seven areas: structures, construction, environmental, energy/climate, fluid mechanics/hydrology, urban systems, or sensors/analytics. Students in the major learn to apply knowledge of mathematics, science, and civil engineering to conduct experiments, design structures and systems to creatively solve engineering problems, and communicate their ideas effectively. The major prepares students for careers in consulting, industry and government, as well as for graduate studies in engineering.

Requirements

		Units
Mathematics and Science		**45**
45 units minimum; see Basic Requirement 1 and 2 [1]		
Technology in Society		
One course required		
CEE 102A	Legal / Ethical Principles in Design, Construction, Project Delivery	3
Engineering Fundamentals		
Two courses required		
ENGR 14	Intro to Solid Mechanics	3
ENGR 90/CEE 70	Environmental Science and Technology	3
Engineering Depth		
Minimum of 68 Engineering Fundamentals plus Engineering Depth; see Basic Requirement 5		
CEE 100	Managing Sustainable Building Projects [2]	4
CS 106A	Programming Methodology (or CS 106B, CS 106X, CEE 101D)	5
ME 30	Engineering Thermodynamics (or CHEMENG 110A)	3
CEE 146S	Engineering Economics and Sustainability	3
CEE 183	Integrated Civil Engineering Design Project (Senior Capstone Design Course)	4
Focus Area Electives: at least 12 units in 1 major focus are, + at least 6 units each in 3 other focus areas (see below; no double counting) [4]		**30**
Additional CEE elective units (either select from focus areas below, from additional approved courses (see Footnote 5), or must be pre-approved by CEE Curriculum Comm.)		**13**
Total Units		116

1. Mathematics must include CME 100 Vector Calculus for Engineers and CME 102 Ordinary Differential Equations for Engineers (or MATH 51 Linear Algebra, Multivariable Calculus, and Modern Applications and Differential Calculus of Several Variables and MATH 53 Ordinary Differential Equations with Linear Algebra) and a Statistics course (STATS 101 Data Science 101 or STATS 110 Statistical Methods in Engineering and the Physical Sciences or CME 106 Introduction to Probability and Statistics for Engineers or CEE 203 Probabilistic Models in Civil Engineering). Science must include PHYSICS 41 Mechanics (or PHYSICS 41E Mechanics, Concepts, Calculations, and Context); either PHYSICS 43 Electricity and Magnetism or PHYSICS 45 Light and Heat; either CHEM 31A Chemical Principles I or CHEM 31M Chemical Principles: From Molecules to Solids; at least one of CEE 177 Aquatic Chemistry and Biology (required for major focus in fluid mechanics/hydrology or environmental quality) or GEOLSCI 1 Introduction to Geology (required for major focus in structural, construction, urban systems, energy/climate or sensing/analytics); and additional physics, chemistry or mathematics to reach 45 units.
2. CEE 100 meets the Writing in the Major (WIM) requirement
3. A course may only be counted towards one requirement; it may not be double-counted. All courses taken for the major must be taken for a letter grade if that option is offered by the instructor. Minimum Combined GPA for all courses in Engineering Fundamentals and Depth is 2.0.
4. To satisfy ABET criteria, electives must include at least 2 of the following 4 courses: CEE 101A, 101B, 101C, 101D.
5. Preapproved courses for additional CEE elective units: ENGR 10, 15, 21, 25E, 40M (or 40A), 50 (or 50E or 50M); CEE 74N, 80N; and up to 4 units of CEE 199 or CEE 199L.

Construction Engineering Focus

		Units
CEE 120A	Building Modeling for Design & Construction	3
CEE 122A & CEE 122B	Computer Integrated Architecture/ Engineering/Construction and Computer Integrated A/E/C (each quarter = 2 units; must take both quarters)	4
CEE 131C	How Buildings are Made -- Materiality and Construction Methods	4
CEE 141A	Infrastructure Project Development	3
CEE 141B	Infrastructure Project Delivery	3
CEE 144	Design and Innovation for the Circular Economy	3
CEE 241	Managing Fabrication and Construction	4

Energy and Climate Focus

		Units
CEE 63	Weather and Storms	3
CEE 64	Air Pollution and Global Warming: History, Science, and Solutions	3
CEE 107A	Understanding Energy (or CEE 107S)	3-5
CEE 107R	E^3: Extreme Energy Efficiency	3
CEE 156	Building Systems Design & Analysis	4
CEE 172	Air Quality Management	3
CEE 176A	Energy Efficient Buildings	3
CEE 176B	100% Clean, Renewable Energy and Storage for Everything	3-4

Environmental Fluid Mechanics & Hydrology Focus

		Units
CEE 101B	Mechanics of Fluids	4
CEE 161I	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
CEE 162D	Introduction to Physical Oceanography	4
CEE 162F	Coastal Processes	3
CEE 162I	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
CEE 166A	Watershed Hydrologic Processes and Models	3
CEE 166B	Water Resources and Hazards	3
CEE 175A	California Coast: Science, Policy, and Law	3-4

Environmental Quality Engineering for Human Health Focus

		Units
CEE 172	Air Quality Management	3
CEE 174A	Providing Safe Water for the Developing and Developed World	3
CEE 174B	Wastewater Treatment: From Disposal to Resource Recovery	3
CEE 175A	California Coast: Science, Policy, and Law (alt. years)	3-4
CEE 178	Introduction to Human Exposure Analysis	3
CEE 265D	Water and Sanitation in Developing Countries	3

Sensing, Analytics and Control Focus

		Units
CEE 101D	Computations in Civil and Environmental Engineering	3
CEE 154	Data Analytics for Physical Systems	3-4
CEE 155	Introduction to Sensing Networks for CEE	3-4
CEE 156	Building Systems Design & Analysis	3
CEE 177L	Smart Cities & Communities	3
ME 161	Dynamic Systems, Vibrations and Control	3-4
ME 210	Introduction to Mechatronics	4

Structural Engineering and Mechanics Focus

		Units
CEE 101A	Mechanics of Materials	4
CEE 101C	Geotechnical Engineering	4
CEE 101D	Computations in Civil and Environmental Engineering	3
CEE 180	Structural Analysis	4
CEE 182	Structural Design	4
CEE 192	Properties of Rocks and Geomaterials	3-4
ME 151	Introduction to Computational Mechanics	4

Urban Systems Focus

		Units
CEE 120A	Building Modeling for Design & Construction	3
CEE 130	Architectural Design: 3-D Modeling, Methodology, and Process	5
CEE 156	Building Systems Design & Analysis	4
CEE 176A	Energy Efficient Buildings	3-4
CEE 177L	Smart Cities & Communities	3
CEE 243	Intro to Urban Sys Engrg	3

Honors Program

This program leads to a B.S. with honors for undergraduates majoring in Civil Engineering or in Environmental Systems Engineering. It is designed to encourage qualified students to undertake a more intensive study of civil and environmental engineering than is required for the normal majors through a substantial, independent research project.

The program involves an in-depth research study in an area proposed to and agreed to by a Department of Civil and Environmental Engineering faculty adviser and completion of a thesis of high quality. A written proposal for the research to be undertaken must be submitted and approved by the faculty adviser in the fourth quarter prior to graduation. At the time of application, the student must have an overall grade point average (GPA) of at least 3.3 for course work at Stanford; this GPA must be maintained to graduation. The thesis is supervised by a CEE faculty adviser and must involve input from the School of Engineering writing program by means of ENGR 202S Directed Writing Projects or ENGR 199W Writing of Original Research for Engineers. The written thesis must be approved by the thesis adviser. Students are encouraged to present their results in a seminar for faculty and students. Up to 10 units of CEE 199H Undergraduate Honors Thesis, may be taken to support the research and writing (not to duplicate ENGR 202S or ENGR 199W). These units are beyond the normal Civil Engineering or Environmental Systems Engineering major program requirements.

For additional information on the major, minor, honors and sample programs see the Handbook for Undergraduate Engineering Programs (UGHB) (http://ughb.stanford.edu).

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10 units of CEE 199H Undergraduate Honors Thesis, may be taken to support the research and writing (not to duplicate ENGR 202S or ENGR 199W). These units are beyond the normal Civil Engineering or Environmental Systems Engineering major program requirements.

Civil Engineering (CE) Minor

The civil engineering minor is intended to give students a focused introduction to one or more areas of civil engineering. Departmental expertise and undergraduate course offerings are available in the areas of Architectural Design, Construction Engineering and Management, and Structural and Geotechnical Engineering. Students interested in Environmental and Water Studies should refer to the Environmental Systems Engineering minor.

The minimum prerequisite for a civil engineering minor is MATH 19 Calculus (or MATH 20 Calculus or MATH 21 Calculus); however, many courses of interest require PHYSICS 41 Mechanics and/or MATH 51 Linear Algebra, Multivariable Calculus, and Modern Applications as prerequisites. The minimum prerequisite for a Civil Engineering minor focusing on architectural design is MATH 19 Calculus (or MATH 20 Calculus or MATH 21 Calculus). Students should recognize that a minor in civil engineering is not an ABET-accredited degree program.

Since undergraduates having widely varying backgrounds may be interested in obtaining a civil engineering minor, and the field itself is so broad, no single set of course requirements will be appropriate for all students. Instead, interested students are encouraged to propose their own set of courses within the guidelines listed below. Additional information, including example minor programs, are provided on the CEE web site (http://cee.stanford.edu/prospective/undergrad/minor_overview.html) and in Chapter 6 of the Handbook for Undergraduate Engineering Programs (http://ughb.stanford.edu/).

General guidelines are:

1. A civil engineering minor must contain at least 24 units of course work not taken for the major, and must consist of at least six classes of at least 3 units each of letter-graded work, except where letter grades are not offered.
2. The list of courses must represent a coherent body of knowledge in a focused area, and should include classes that build upon one another. Example programs are given on the CEE webpage.

Professor Anne Kiremidjian (kiremidjian@stanford.edu) is the CEE undergraduate minor adviser in Structural Engineering and Construction Engineering and Management. John Barton (jhbarton@stanford.edu (http://www.stanford.edu/dept/registrar/bulletin/jhbarton@stanford.edu)), Program Director for Architectural Design, is the undergraduate minor adviser in Architectural Design. Students must consult the appropriate adviser when developing their minor program, and obtain approval of the finalized study list from them.