

# Structural Engineering

## Minor

The Minor in Structural Engineering is designed primarily for students in the College of Environmental Design to experience the engineering approach to the solution of design problems, but it is available to students from any department who meet the following prerequisites to apply:

1. Understanding of material behavior for structural response and ability to describe such behavior with simple models
2. Understanding of structures and methods of analysis
3. Design of structures made of steel, concrete or timber

These basic fundamental courses are complemented by additional courses in materials and construction and analysis; see below for a complete course listing.

The minor offers to students of the College of Environmental Design access to the joint graduate MS/MARCH Degree of the two departments. With it comes the ability to practice either as an architect or as a structural engineer with a very thorough knowledge of the other field. Whereas engineering focuses on analytical methods for the solution of problems, the visual, socio-economical approach of architecture courses is an indispensable complement. The same is true the other way.

## Declaring the Minor

To be considered for admission to the minor, students should satisfy the following:

- Have an overall grade point average (GPA) of 3.0
- Have completed the lower division prerequisite courses with a GPA of 3.0 (for further information regarding the prerequisites, see the Minor Requirements tab on this page)
- Be able to complete the minor without delaying graduation

Upon admission to the minor, students should:

- Complete a minimum of five courses, of which no more than one can be counted toward the requirements for the major(s)
- Earn a minimum GPA of 2.0 in the minor

After completion of the prerequisite courses, students need to complete and submit to the Civil and Environmental Academic Affairs office (750 Davis Hall) a Minor Program Application form.

Upon completion of the minor requirements, the student must complete and submit to the Civil and Environmental Engineering Department's Office of Academic Affairs the Confirmation of Completion form during the first 2 weeks of the term in which the minor will be completed.

## Other Majors and Minors Offered by the Department of Civil and Environmental Engineering

Civil Engineering (<http://guide.berkeley.edu/archive/2021-22/undergraduate/degree-programs/civil-engineering/>) (Major only)

Environmental Engineering (<http://guide.berkeley.edu/archive/2021-22/undergraduate/degree-programs/environmental-engineering/>) (Minor only)

Geotechnical Engineering (<http://guide.berkeley.edu/archive/2021-22/undergraduate/degree-programs/geotechnical-engineering/>) (Minor only)

Minor programs are areas of concentration requiring fewer courses than an undergraduate major. These programs are optional, but they can provide depth and breadth to a UC Berkeley education. The College of Engineering does not offer additional time to complete a minor, but it is usually possible to finish within the allotted time with careful course planning. Students are encouraged to meet with their ESS adviser to discuss the feasibility of completing a minor program.

All the engineering departments offer minors. Students may also consider pursuing a minor in another school or college.

All minors must be declared no later than one semester before a student's Expected Graduation Term (EGT). If the semester before EGT is fall or spring, the deadline is the last day of RRR week. If the semester before EGT is summer, the deadline is the final Friday of Summer Sessions. To declare a minor, contact the department advisor for information on requirements, and the declaration process.

## Lower Division Prerequisites

Select one of the following math sequences:		8
MATH 1A & MATH 1B	Calculus and Calculus	
MATH 16A & MATH 16B	Analytic Geometry and Calculus and Analytic Geometry and Calculus	
PHYSICS 7A or PHYSICS 8/Introductory Physics	Physics for Scientists and Engineers	4
CIV ENG C30/ MEC ENG C85	Introduction to Solid Mechanics <sup>1</sup>	3

## Requirements

CIV ENG 60	Structure and Properties of Civil Engineering Materials	3
CIV ENG 120	Structural Engineering	3
CIV ENG 122	Design of Steel Structures	3
	or CIV ENG 123 Design of Reinforced Concrete Structures	
Select two courses from the following:		8
CIV ENG 123	Design of Reinforced Concrete Structures	3
	or CIV ENG 122 Design of Steel Structures	
CIV ENG 124	Structural Design in Timber	3
CIV ENG 132	Applied Structural Mechanics	3
CIV ENG C133/ MEC ENG C180	Engineering Analysis Using the Finite Element Method	3
CIV ENG 140	Failure Mechanisms in Civil Engineering Materials	3
CIV ENG 165	Concrete Materials, Construction, and Sustainability	3
CIV ENG 166	Construction Engineering	3
CIV ENG 175	Geotechnical and Geoenvironmental Engineering	3
CIV ENG 193	Engineering Risk Analysis	3

## University of California Requirements

Entry Level Writing (<https://www.ucop.edu/elwr/>)

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing Requirement. Satisfaction of this requirement is also a

prerequisite to enrollment in all Reading and Composition courses at UC Berkeley.

American History and American Institutions (<http://guide.berkeley.edu/archive/2021-22/undergraduate/education/#universityrequirementstext>)

The American History and Institutions requirements are based on the principle that a U.S. resident who has graduated from an American university should have an understanding of the history and governmental institutions of the United States.

## Campus Requirement

American Cultures (<http://guide.berkeley.edu/archive/2021-22/undergraduate/education/#campusrequirementstext>)

The American Cultures requirement is a Berkeley campus requirement, one that all undergraduate students at Berkeley need to pass in order to graduate. You satisfy the requirement by passing, with a grade not lower than C- or P, an American Cultures course. You may take an American Cultures course any time during your undergraduate career at Berkeley. The requirement was instituted in 1991 to introduce students to the diverse cultures of the United States through a comparative framework. Courses are offered in more than fifty departments in many different disciplines at both the lower and upper division level.

The American Cultures requirement and courses constitute an approach that responds directly to the problem encountered in numerous disciplines of how better to present the diversity of American experience to the diversity of American students whom we now educate.

Faculty members from many departments teach American Cultures courses, but all courses have a common framework. The courses focus on themes or issues in United States history, society, or culture; address theoretical or analytical issues relevant to understanding race, culture, and ethnicity in American society; take substantial account of groups drawn from at least three of the following: African Americans, indigenous peoples of the United States, Asian Americans, Chicano/Latino Americans, and European Americans; and are integrative and comparative in that students study each group in the larger context of American society, history, or culture.

This is not an ethnic studies requirement, nor a Third World cultures requirement, nor an adjusted Western civilization requirement. These courses focus upon how the diversity of America's constituent cultural traditions have shaped and continue to shape American identity and experience.

Visit the Class Schedule (<http://classes.berkeley.edu/>) or the American Cultures website (<http://americancultures.berkeley.edu/>) for the specific American Cultures courses offered each semester. For a complete list of approved American Cultures courses at UC Berkeley and California Community Colleges, please see the American Cultures Subcommittee's website (<https://academic-senate.berkeley.edu/committees/amcult/>). See your academic adviser if you have questions about your responsibility to satisfy the American Cultures breadth requirement.

## Structural Engineering

Expand all course descriptions [+][Collapse all course descriptions \[-\]](#)

## CIV ENG 11 Engineered Systems and Sustainability 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

An introduction to key engineered systems (e.g., energy, water supply, buildings, transportation) and their environmental impacts. Basic principles of environmental science needed to understand natural processes as they are influenced by human activities. Overview of concepts and methods of sustainability analysis. Critical evaluation of engineering approaches to address sustainability.

Engineered Systems and Sustainability: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** CHEM 1A and MATH 1A

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Harley, Horvath, Nelson

Engineered Systems and Sustainability: [Read Less](#) [-]

## CIV ENG 24 Freshman Seminars 1 Unit

Terms offered: Spring 2020, Fall 2019, Spring 2019

The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley seminars are offered in all campus departments, and topics vary from department to department and semester to semester.

Freshman Seminars: [Read More](#) [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit when topic changes.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of seminar per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final Exam To be decided by the instructor when the class is offered.

Freshman Seminars: [Read Less](#) [-]

## CIV ENG C30 Introduction to Solid Mechanics 3 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022  
A review of equilibrium for particles and rigid bodies. Application to truss structures. The concepts of deformation, strain, and stress. Equilibrium equations for a continuum. Elements of the theory of linear elasticity. The states of plane stress and plane strain. Solution of elementary elasticity problems (beam bending, torsion of circular bars). Euler buckling in elastic beams.

Introduction to Solid Mechanics: Read More [+]

### Rules & Requirements

**Prerequisites:** Mathematics 53 and 54 (may be taken concurrently); Physics 7A

**Credit Restrictions:** Students will receive no credit for Mechanical Engineering C85/Civil and Environmental Engineering C30 after completing Mechanical Engineering W85. A deficient grade in Mechanical Engineering W85 may be removed by taking Mechanical Engineering C85/Civil and Environmental Engineering C30.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Summer:

6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week  
10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Armero, Papadopoulos, Zohdi, Johnson

**Also listed as:** MEC ENG C85

Introduction to Solid Mechanics: Read Less [-]

## CIV ENG W30 Introduction to Solid Mechanics 3 Units

Terms offered: Summer 2021 8 Week Session, Summer 2020 8 Week Session, Summer 2019 8 Week Session

A review of equilibrium for particles and rigid bodies. Application to truss structures. The concepts of deformation, strain, and stress. Equilibrium equations for a continuum. Elements of the theory of linear elasticity. The states of plane stress and plane strain. Solution of elementary elasticity problems (beam bending, torsion of circular bars). Euler buckling in elastic beams.

Introduction to Solid Mechanics: Read More [+]

### Objectives & Outcomes

**Course Objectives:** To learn statics and mechanics of materials

### Student Learning Outcomes: -

Correctly draw free-body

-

Apply the equations of equilibrium to two and three-dimensional solids

-

Understand the concepts of stress and strain

-

Ability to calculate deflections in engineered systems

-

Solve simple boundary value problems in linear elastostatics (tension, torsion, beam bending)

### Rules & Requirements

**Prerequisites:** MATH 53 and MATH 54 (may be taken concurrently); PHYSICS 7A

**Credit Restrictions:** Students will receive no credit for MEC ENG W85 after completing MEC ENG C85. A deficient grade in MEC ENG W85 may be removed by taking MEC ENG C85.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of web-based lecture and 1 hour of web-based discussion per week

### Summer:

6 weeks - 7.5 hours of web-based lecture and 2.5 hours of web-based discussion per week

8 weeks - 6 hours of web-based lecture and 2 hours of web-based discussion per week

10 weeks - 4.5 hours of web-based lecture and 1.5 hours of web-based discussion per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Govindjee

**Also listed as:** MEC ENG W85

Introduction to Solid Mechanics: Read Less [-]

## CIV ENG 60 Structure and Properties of Civil Engineering Materials 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Introduction to structure and properties of civil engineering materials such as asphalt, cements, concrete, geological materials (e.g. soil and rocks), steel, polymers, and wood. The properties range from elastic, plastic and fracture properties to porosity and thermal and environmental responses. Laboratory tests include evaluation of behavior of these materials under a wide range of conditions.

Structure and Properties of Civil Engineering Materials: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Monteiro, Ostertag

Structure and Properties of Civil Engineering Materials: Read Less [-]

## CIV ENG 70 Engineering Geology 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Principles of physical and structural geology; the influence of geological factors on engineering works and the environment. Field trip.

Engineering Geology: Read More [+]

### Rules & Requirements

**Prerequisites:** CHEM 1A (may be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

**Summer:** 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Glaser, Sitar

Engineering Geology: Read Less [-]

## CIV ENG 88B Time Series Analysis: Sea Level Rise and Coastal Flooding 2 Units

Terms offered: Spring 2017

In this course, we will pursue analysis of long-term records of coastal water levels in the context of sea level rise. We will cover the collection, evaluation, visualization and analysis of time series data using long-term records of sea levels from coastal sites around the world. Specific topics will include extreme events and distributions, frequency-based descriptions, averaging, filtering, harmonic analysis, trend identification, extrapolations, and decision-making under uncertainty.

Time Series Analysis: Sea Level Rise and Coastal Flooding: Read More [+]

### Rules & Requirements

**Prerequisites:** Concurrent or prior enrollment in Foundations of Data Science (COMPSCI C8 / INFO C8 / STAT C8) and MATH 1A

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 1 hour of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Stacey

Time Series Analysis: Sea Level Rise and Coastal Flooding: Read Less [-]

## CIV ENG C88 Data Science for Smart Cities 2 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Cities become more dependent on the data flows that connect infrastructures between themselves, and users to infrastructures.

Design and operation of smart, efficient, and resilient cities nowadays require data science skills. This course provides an introduction to working with data generated within transportation systems, power grids, communication networks, as well as collected via crowd-sensing and remote sensing technologies, to build demand- and supply-side urban services based on data analytics.

Data Science for Smart Cities: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Become familiar with urban big data and sensor data collection techniques.

Develop intuition in various machine learning classification algorithms, as well as regression modelling.

Develop intuition in various machine learning classification algorithms, as well as regression modelling.

Foster critical thinking about real-world actionability from analytics.

Learn how to use data science techniques in urban decision-making and scenario generation.

**Student Learning Outcomes:** Develop capabilities in a range of data science techniques.

Gain the ability to solve problems in smart city research and practice.

Think critically about how to assess analytics for cities.

Use data analytics in the smart city domain.

### Rules & Requirements

**Prerequisites:** This course is a Data Science connector course and is meant to be taken concurrent with or after Foundations of Data Science COMPSCI C8/INFO C8/STAT C8. Students may take more than one Data Science connector course if they wish, concurrently or after taking the C8 course

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Gonzalez

**Formerly known as:** Civil and Environmental Engineering 88

**Also listed as:** CY PLAN C88

Data Science for Smart Cities: Read Less [-]

## CIV ENG 92 Introduction to Civil and Environmental Engineering 1 Unit

Terms offered: Fall 2019, Fall 2018, Fall 2017

A course designed to familiarize the entering student with the nature and scope of civil and environmental engineering and its component specialty areas.

Introduction to Civil and Environmental Engineering: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Introduction to Civil and Environmental Engineering: Read Less [-]

## CIV ENG 92A Design for Future Infrastructure Systems 2 Units

Terms offered: Spring 2022, Fall 2020

Hands-on engineering design experience for creating future infrastructure systems. Intelligent infrastructure systems leverage data and computational to enhance sustainability and resilience for smart cities of the future. Student teams identify a challenge with current transportation, energy, water, waste, and/or the built infrastructure. Student teams design and prototype an innovation that solves this problem using maker resources, e.g. 3D printing, laser cutters, and open-source electronics. The project will be executing via the "Design Sprint" process, which is popular in agile development and Silicon Valley. Students present projects to guest judges from industry. Course is an introductory design experience for first-year students.

Design for Future Infrastructure Systems: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Alternative to final exam.

**Instructor:** Moura

Design for Future Infrastructure Systems: Read Less [-]

## CIV ENG 92B Cornerstone Structural Design 2 Units

Terms offered: Spring 2022

This course introduces students to conceptual structural design, fabrication, and testing. The course aims to provide a hands-on structural engineering design experience and to inspire creativity. Students will learn the design process as well as fundamental principles of structural analysis. Student teams will be given a design challenge with performance objectives and practical constraints that emphasize sustainable design practices. Student teams will use maker space resources (e.g. 3D printing, laser cutting, CNC router, woodshop) to fabricate their structures, which will be tested to failure in the Structural Engineering Lab in Davis Hall.

Cornerstone Structural Design: [Read More](#) [+]

### Objectives & Outcomes

#### Student Learning Outcomes: -

Explain basic concepts of statics and equilibrium.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** DeJong

Cornerstone Structural Design: [Read Less](#) [-]

## CIV ENG 93 Engineering Data Analysis 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Application of the concepts and methods of probability theory and statistical inference to CEE problems and data; graphical data analysis and sampling; elements of set theory; elements of probability theory; random variables and expectation; simulation; statistical inference. Use of computer programming languages for analysis of CEE-related data and problems. The course also introduces the student to various domains of uncertainty analysis in CEE.

Engineering Data Analysis: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** ENGIN 7 or COMPSCI C8 / INFO C8 / STAT C8. Student should consult instructor prior to enrolling

**Credit Restrictions:** Students will receive no credit after taking Statistics 25.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

**Summer:** 6 weeks - 5 hours of lecture and 7.5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Hansen, Rubin, Walker

Engineering Data Analysis: [Read Less](#) [-]



## CIV ENG 98 Supervised Group Study and Research 1 - 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Supervised group study and research by lower division students.

Supervised Group Study and Research: Read More [+]

### Rules & Requirements

**Prerequisites:** Consent of instructor

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Group Study and Research: Read Less [-]

## CIV ENG 99 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Supervised independent study by lower division students.

Supervised Independent Study and Research: Read More [+]

### Rules & Requirements

**Prerequisites:** Freshman or sophomore standing and consent of instructor. Minimum grade point average of 3.3 required

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

**Summer:** 8 weeks - 2-7.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study and Research: Read Less [-]

## CIV ENG 100 Elementary Fluid Mechanics 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Fluid statics and dynamics, including laboratory experiments with technical reports. Fundamentals: integral and differential formulations of the conservation laws are solved in special cases such as boundary layers and pipe flow. Flow visualization and computation techniques are introduced using Matlab. Empirical equations are used for turbulent flows, drag, pumps, and open channels. Principles of empirical equations are also discussed: dimensional analysis, regression, and uncertainty.

Elementary Fluid Mechanics: Read More [+]

### Rules & Requirements

**Prerequisites:** PHYSICS 7A, MATH 53, and ENGIN 7 (may be taken concurrently); and CIV ENG C30 / MEC ENG C85 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

**Summer:** 8 weeks - 6 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Chow, Stacey, Variano

Elementary Fluid Mechanics: Read Less [-]

## CIV ENG C103N Terrestrial Hydrology 4 Units

Terms offered: Fall 2022, Spring 2021, Spring 2020

A quantitative introduction to the hydrology of the terrestrial environment including lower atmosphere, watersheds, lakes, and streams. All aspects of the hydrologic cycle, including precipitation, infiltration, evapotranspiration, overland flow, streamflow, and groundwater flow. Chemistry and dating of groundwater and surface water. Development of quantitative insights through problem solving and use of simple models. This course requires one field experiment and several group computer lab assignments.

Terrestrial Hydrology: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** CHEM 1A, MATH 1A, MATH 1B, and PHYSICS 7A; or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Larsen

**Also listed as:** ESPM C130/GEOG C136

Terrestrial Hydrology: [Read Less](#) [-]

## CIV ENG 104 Planetary Boundaries and the Anthropocene 1 Unit

Terms offered: Fall 2022, Fall 2021, Spring 1998

This course aims to introduce students to the debates and discussions about the impact of increasing human resource consumption, increasing population, and increasing human prosperity on the planet's environmental systems that support human societies.

Planetary Boundaries and the Anthropocene: [Read More](#) [+]

### Objectives & Outcomes

**Course Objectives:** Explain the major arguments on the sides of “planetary boundaries” and “cornucopia”  
Understand the basic system dynamics view of planetary systems  
Understand the main features of several of planetary boundaries that have scientific consensus

### Rules & Requirements

**Prerequisites:** Upper division undergraduate standing

**Credit Restrictions:** Students will receive no credit for CIV ENG 104 after completing CIV ENG 104. A deficient grade in CIV ENG 104 may be removed by taking CIV ENG 104.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of seminar per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructors:** Chow , Gadgil

Planetary Boundaries and the Anthropocene: [Read Less](#) [-]



## CIV ENG 105 Design for Global Transformation 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Student teams will design strategies to address critical global challenges, such as climate change, biodiversity loss, pollution, and related issues, with the potential for transformational change. Project topics will vary. Students will explore global to local scales using principles and practices from design science, systems thinking, regenerative design, circular economy, environmental justice, science communication, data visualization, and numerical modeling, among other disciplines.

Design for Global Transformation: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Create a multi-media exhibit to clearly communicate your findings and strategy

Iteratively design a comprehensive strategy to address your team's global challenge

To gain familiarity with relevant design and engineering tools, including data visualization and simulation and modeling

Work strategically and collaboratively with fellow students in a design team

### Rules & Requirements

**Prerequisites:** At least one of the following courses: CIV ENG C103N / ESPM C130 / GEOG C136, CIV ENG 111, CIV ENG 120, CIV ENG 155, CIV ENG 175, or CIV ENG 191; or instructor's permission

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Chow

Design for Global Transformation: Read Less [-]

## CIV ENG C106 Air Pollution 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

This course is an introduction to air pollution and the chemistry of earth's atmosphere. We will focus on the fundamental natural processes controlling trace gas and aerosol concentrations in the atmosphere, and how anthropogenic activity has affected those processes at the local, regional, and global scales. Specific topics include stratospheric ozone depletion, increasing concentrations of green house gasses, smog, and changes in the oxidation capacity of the troposphere.

Air Pollution: Read More [+]

### Rules & Requirements

**Prerequisites:** CHEM 1A, CHEM 1B, and PHYSICS 8A or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Goldstein

**Also listed as:** EPS C180/ESPM C180

Air Pollution: Read Less [-]

## CIV ENG 107 Climate Change Mitigation 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019

Assessment of technological options for responding to climate change. Overview of climate-change science; sources, sinks, and atmospheric dynamics of greenhouse gases. Current systems for energy supply and use. Renewable energy resources, transport, storage, and transformation technologies. Technological opportunities for improving end-use energy efficiency. Recovery, sequestration, and disposal of greenhouse gases. Societal context for implementing engineered responses.

Climate Change Mitigation: Read More [+]

### Rules & Requirements

**Prerequisites:** Upper division or graduate standing in engineering or physical science, or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Climate Change Mitigation: Read Less [-]

## CIV ENG 108 Climate Change Adaptation 3 Units

Terms offered: Spring 2022, Fall 2009, Spring 2009

In this course, we will examine the local manifestation of global climate change and consider interventions and responses that anticipate long-term change in communities. The course will integrate environmental sciences, civil and environmental engineering, and the social sciences to both understand the impacts of global change and to quantitatively evaluate possible adaptation interventions. Upon completing the course, you will have a holistic perspective on the challenges associated with climate change adaptation, an understanding of the wide range of potential solutions and interventions that may be possible, and an awareness of the strengths and weaknesses of those solutions. Climate Change Adaptation: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 11 or introductory climate science course, or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Stacey

Climate Change Adaptation: Read Less [-]

## CIV ENG 110 Water Systems of the Future 3 Units

Terms offered: Spring 2022, Spring 2020, Spring 2019

This course will familiarize students with the complex infrastructure used to meet human water demands; competing uses and demands; water and wastewater infrastructure; technologies to enable recovery of water, energy, and other resources from wastewater; supply planning; trends and forecasting; costs, pricing and financing; environmental justice; methods to assess sustainability; regulatory, policy and institutional challenges; and water's contribution to other sectors (e.g., energy, food, buildings). Innovation, both barriers and opportunities, will be highlighted. California and the U.S. will be emphasized but global challenges will be discussed. Students will study, critique, and recommend improvements for a real-world system. Water Systems of the Future: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Consider costs and tradeoffs in water supply planning under uncertainty for real-world water systems  
Critically evaluate water planning and innovation potential for real-world utilities given future uncertainties and competing priorities.  
Explore the innovation ecosystem in the water sector, its opportunities and challenges, and analyze case studies  
Introduce the technologies that are currently in use for treating and managing water and wastewater, as well as innovations that have the potential to dramatically change water infrastructure.  
Provide overview and examples of concepts and methods for analyzing the sustainability of water systems  
Provide overview of the complex infrastructure systems that supply and manage water and wastewater.

**Student Learning Outcomes:** Ability to apply knowledge of mathematics, science, and engineering. MODERATE  
Ability to communicate effectively. EXTENSIVE  
Ability to design a system, component, or process to meet desired needs. MODERATE  
Ability to function on multi-disciplinary teams. EXTENSIVE  
Ability to identify, formulate and solve engineering problems. MODERATE  
Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. MODERATE  
Knowledge of contemporary issues. EXTENSIVE  
Recognition of the need for, and an ability to engage in life-long learning. EXTENSIVE  
Understand the impact of engineering solutions in a global and societal context. EXTENSIVE  
Understanding of professional and ethical responsibility. EXTENSIVE

### Rules & Requirements

**Prerequisites:** Upper division status or consent of the instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Nelson

Water Systems of the Future: Read Less [-]

## CIV ENG 111 Environmental Engineering 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Quantitative overview of air and water contaminants and their engineering control. Elementary environmental chemistry and transport. Reactor models. Applications of fundamentals to selected current issues in water quality engineering, air quality engineering, air quality engineering, and hazardous waste management.

Environmental Engineering: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Upper division standing in engineering or physical sciences, or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Alvarez-Cohen, Nelson, Sedlak

Environmental Engineering: [Read Less](#) [-]

## CIV ENG 111L Water and Air Quality Laboratory 1 Unit

Terms offered: Fall 2022, Fall 2021, Fall 2019

This laboratory course is designed to accompany the lecture topics in Civil Engineering 111. Each laboratory activity will provide an opportunity to understand key concepts in water and air quality through hands-on experimentation. Laboratory topics include phase partitioning, acid/base reactions, redox reactions, biochemical oxygen demand, absorption, gas transfer, reactor hydraulics, particle destabilization, disinfection, and combustion emissions.

Water and Air Quality Laboratory: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 111 (may be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Alvarez-Cohen, Nelson, Sedlak

Water and Air Quality Laboratory: [Read Less](#) [-]

## CIV ENG 112 Water & Wastewater Systems Design and Operation 3 Units

Terms offered: Fall 2022, Spring 2017, Spring 2016

Water and wastewater systems serving communities are complex, large, and were built and expanded over many decades. The infrastructure includes a network of reservoirs, pipelines, pump stations, treatment plants, and other facilities that are connected to natural systems such as watersheds, rivers, groundwater basins, and bay and ocean environments. The planning, design, operation, and maintenance of urban water and wastewater systems require balancing many factors including aging infrastructure, changing regulations, climate change, costs, and community impacts.

One of the greatest challenges facing civil engineers in the 21st century is the stewardship of the infrastructure to protect public health and the environment. Existing systems r

Water & Wastewater Systems Design and Operation: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 100 and CIV ENG 111

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Soga

Water & Wastewater Systems Design and Operation: [Read Less](#) [-]

## CIV ENG 113 Ecological Engineering for Water Quality Improvement 3 Units

Terms offered: Spring 2021, Spring 2019, Spring 2017

Ecological engineering approaches for treating contaminated water using natural processes to improve water quality. Emphasis on combining basic science and engineering approaches to understand the fundamental processes that govern the effectiveness of complex natural treatment systems. Applications include constructed wetlands, waste stabilization ponds, stormwater bioretention, decentralized wastewater management, ecological sanitation. Laboratory sessions will consist of design and monitoring of laboratory and full-scale natural treatment systems, including a range of water quality measurements.

Ecological Engineering for Water Quality Improvement: Read More [\[+\]](#)

### Objectives & Outcomes

**Course Objectives:** Become familiar with common applications of natural treatment systems through lectures, reading materials, laboratory activities, and field trips

Develop a solid understanding of the fundamental processes in ecological engineering approaches to natural treatment systems that govern the removal or transformation of contaminants in water

Learn common design approaches for waste stabilization ponds and wetlands, as well as their necessary operation and maintenance activities Measure key water quality parameters and evaluate the performance of mesocosm ponds and wetlands based on the data collected throughout the semester

Understand and appreciate the complexity of these systems compared to mechanical treatment systems

**Student Learning Outcomes:** Ability to apply knowledge of mathematics, science, and engineering. EXTENSIVE  
Ability to communicate effectively. MODERATE  
Ability to design a system, component, or process to meet desired needs. EXTENSIVE

Ability to design and conduct experiments, as well as to analyze and interpret data. EXTENSIVE

Ability to function on multi-disciplinary teams. MODERATE

Ability to identify, formulate and solve engineering problems. EXTENSIVE

Ability to use the techniques, skills, and modern engineering tools

necessary for engineering practice. EXTENSIVE

Knowledge of contemporary issues. MODERATE

Recognition of the need for, and an ability to engage in life-long learning. MODERATE

Understand the impact of engineering solutions in a global and societal context. MODERATE

Understanding of professional and ethical responsibility. MODERATE

### Rules & Requirements

**Prerequisites:** CIV ENG 111 or consent of instructor

**Credit Restrictions:** Civ Eng 113N

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Nelson

**Formerly known as:** Civil and Environmental Engineering 113N

## CIV ENG 114 Environmental Microbiology 3 Units

Terms offered: Spring 2016, Spring 2015, Fall 2014

The scope of modern environmental engineering requires a fundamental knowledge of microbial processes with specific application to water, wastewater and the environmental fate of pollutants. This course will cover basic microbial physiology, biochemistry, metabolism, growth energetics and kinetics, ecology, pathogenicity, and genetics for application to both engineered and natural environmental systems.

Environmental Microbiology: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CHEM 1A and CHEM 1B

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Alvarez-Cohen

Environmental Microbiology: Read Less [\[-\]](#)

## CIV ENG 115 Water Chemistry 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

The application of principles of inorganic, physical, and dilute solution equilibrium chemistry to aquatic systems, both in the aquatic environment and in water and wastewater treatment processes.

Water Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Upper division or graduate standing in engineering or physical science, or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Sedlak

Water Chemistry: Read Less [\[-\]](#)

## CIV ENG C116 Chemistry of Soils 3 Units

Terms offered: Fall 2021, Fall 2020, Spring 2018

Chemical mechanisms of reactions controlling the fate and mobility of nutrients and pollutants in soils. Role of soil minerals and humus in geochemical pathways of nutrient bioavailability and pollutant detoxification. Chemical modeling of nutrient and pollutant soil chemistry. Applications to soil acidity and salinity.

Chemistry of Soils: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 111

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** ESPM C128

Chemistry of Soils: Read Less [-]

## CIV ENG 120 Structural Engineering 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Introduction to design and analysis of structural systems. Loads and load placement. Proportioning of structural members in steel, reinforced concrete, and timber. Structural analysis theory. Hand and computer analysis methods, validation of results from computer analysis. Applications, including bridges, building frames, and long-span cable structures.

Structural Engineering: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG C30 / MEC ENG C85 and CIV ENG 60 (may be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Moehle

Structural Engineering: Read Less [-]

## CIV ENG 122 Design of Steel Structures 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

A first course in steel design focusing on basic principles. Introduction to materials and methods of steel construction; behavior and design of tension members, compression members, flexural members and beam-columns; design of welds, bolts, shear connections, and moment connections. Includes laboratory sessions to illustrate member behavior. By the end of the course students should be able to design simple steel structures subjected to static gravity and lateral loads. Design teams will conceive, determine design loads, and conduct a preliminary and final design of a structural system and its foundation. Teams will prepare a report containing project description, design criteria, structural drawings, and supporting calculations.

Design of Steel Structures: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 120

**Credit Restrictions:** Students will receive no credit for CIV ENG 122 after completing CIV ENG 122N, or CIV ENG 122. A deficient grade in CIV ENG 122 may be removed by taking CIV ENG 122N, or CIV ENG 122.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Becker

Design of Steel Structures: Read Less [-]

## CIV ENG 123 Design of Reinforced Concrete Structures 3 Units

Terms offered: Spring 2022, Spring 2021, Fall 2015

Introduction to materials and methods of reinforced concrete design and construction; behavior and design of reinforced concrete beams and one-way slabs considering deflections, moment, shear, and reinforcement development requirements; behavior and design of columns; design of spread footings; design of earthquake-resistant structures; laboratory sessions to illustrate member behavior, to solve problem sets, and to develop and present the preliminary designs for a design project.

Design of Reinforced Concrete Structures: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 120

**Credit Restrictions:** Students will receive no credit for CIV ENG 123 after completing CIV ENG 123N, or CIV ENG 123. A deficient grade in CIV ENG 123 may be removed by taking CIV ENG 123N, or CIV ENG 123.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Moehle

Design of Reinforced Concrete Structures: Read Less [-]

## CIV ENG 124 Structural Design in Timber 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Characteristics and properties of wood as a structural material; design and detailing of structural elements and entire structures of wood. Topics include allowable stresses, design and detailing of solid sawn and glulam beams and columns, nailed and bolted connections, plywood diaphragms and shear walls. Case studies.

Structural Design in Timber: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 120

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Structural Design in Timber: Read Less [-]

## CIV ENG 126 Engineering Dynamics and Vibrations 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Introduction to the dynamics of particles, rigid bodies, and deformable solids in civil engineering. Newtonian and Lagrangian formulations. Vibration of particles and rigid body systems: natural frequencies and mode shapes, free and forced vibration. Vibration of continuous systems: bars, strings, beams. Modeling and numerical simulation methods..

Engineering Dynamics and Vibrations: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG C30 / MEC ENG C85 and ENGIN 7; or consent of instructor

**Credit Restrictions:** Students will receive no credit for CIV ENG 126 after completing MEC ENG 104. A deficient grade in CIV ENG 126 may be removed by taking MEC ENG 104, or MEC ENG 104.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Konstantinidis, DeJong

Engineering Dynamics and Vibrations: Read Less [-]



## CIV ENG 132 Applied Structural Mechanics 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Concepts of theory of solid mechanics: three dimensional stress, strain, and material response; elastic and inelastic boundary value problems; fracture, fatigue, and geometric instability. Problems in advanced strength of materials; thin plate and axis-symmetric shell theory.

Applied Structural Mechanics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CIV ENG C30 / MEC ENG C85, MATH 53 and MATH 54

**Credit Restrictions:** Students will receive no credit for CivEng 132 after CivEng 130N.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

**Summer:** 8 weeks - 6 hours of lecture and 2 hours of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Govindjee, Li, Konstantinidis

Applied Structural Mechanics: Read Less [\[-\]](#)

## CIV ENG C133 Engineering Analysis Using the Finite Element Method 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

This is an introductory course on the finite element method and is intended for seniors in engineering and applied science disciplines. The course covers the basic topics of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems. Finite element formulations for several important field equations are introduced using both direct and integral approaches. Particular emphasis is placed on computer simulation and analysis of realistic engineering problems from solid and fluid mechanics, heat transfer, and electromagnetism. The course uses FEMLAB, a multiphysics MATLAB-based finite element program that possesses a wide array of modeling capabilities and is ideally suited for instruction. Assignments will involve both paper- and computer-based exercises. Computer-based assignments will emphasize the practical aspects of finite element model construction and analysis.

Engineering Analysis Using the Finite Element Method: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Engineering 7 or 77 or Computer Science 61A; Mathematics 53 and 54; senior status in engineering or applied science

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** MEC ENG C180

Engineering Analysis Using the Finite Element Method: Read Less [\[-\]](#)

## CIV ENG C138 Flight Vehicle Structures and Aeroelasticity 3 Units

Terms offered: Not yet offered

This course introduces engineering students to the analysis and design of load-bearing components of flight structures, ranging from subsonic aircraft to rockets. Emphasis is placed on the quasi-static and dynamic analysis of structural components which are prevalent in aerospace engineering. Attention is also devoted to a comprehensive design roadmap of flight vehicle structures from the full system- to the individual component-level

Flight Vehicle Structures and Aeroelasticity: Read More [\[+\]](#)

### Objectives & Outcomes

**Course Objectives:** 1. Familiarize students with the different load-bearing components and loads encountered in flight vehicles.

2. Sharpen the students' skills in the statics and dynamics of thin-walled structures.

3. Enhance the students' aerospace engineering design skills by leveraging the use of the finite element method as a tool for both global and local analysis.

**Student Learning Outcomes:** Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

(g) A knowledge of contemporary issues.

Ability to apply knowledge of mathematics, science, and engineering.

Ability to design and conduct experiments, as well as to analyze and interpret data

Ability to identify, formulate, and solve engineering problems.

Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Understanding of professional and ethical responsibility.

### Rules & Requirements

**Prerequisites:** CIV ENG C30 / MEC ENG C85, and MEC ENG 104 or CIV ENG 126

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Papadopoulos

**Formerly known as:** Mechanical Engineering 184

**Also listed as:** AERO ENG C184/MEC ENG C184

Flight Vehicle Structures and Aeroelasticity: Read Less [\[-\]](#)

## CIV ENG 140 Failure Mechanisms in Civil Engineering Materials 3 Units

Terms offered: Spring 2013, Spring 2010, Spring 2009

The failure mechanisms in civil engineering materials (cement-based materials, metallic- and polymer-based materials) are associated with processing, microstructure, stress states, and environmental changes. Fracture mechanics of brittle, quasi-brittle, and ductile materials; cracking processes in monolithic, particulate, and fiber reinforced materials; examples of ductile/brittle failure transitions in civil engineering structures; retrofitting of existing structures; non-destructive techniques for damage detection.

Failure Mechanisms in Civil Engineering Materials: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CIV ENG 60

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Ostertag

Failure Mechanisms in Civil Engineering Materials: Read Less [\[-\]](#)

## CIV ENG 153 Transportation Facility Design 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

A capstone class with the objective to design transportation facilities based on operational capacity, site constraints, and environmental design considerations. Emphasis on airports, including landside and airside elements, and environmental assessment and mitigation techniques.

Transportation Facility Design: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CIV ENG 155

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Hansen

Transportation Facility Design: Read Less [\[-\]](#)

## CIV ENG 155 Transportation Systems Engineering 3 Units

Terms offered: Fall 2022, Fall 2021, Spring 2021

Operation, management, control, design, and evaluation of passenger and freight transportation systems. Their economic role. Demand analysis. Overall logistical structure. Performance models and modeling techniques: time-space diagrams, queuing theory, network analysis, and simulation. Design of control strategies for simple systems. Feedback effects. Paradoxes. Transportation impact modeling; noise; air pollution. Multi-criteria evaluation and decision making. Financing and politics. Transportation Systems Engineering: Read More [+]

### Rules & Requirements

**Prerequisites:** Sophomore standing in engineering or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Cassidy, Daganzo, Hansen, Kanafani, Madanat

Transportation Systems Engineering: Read Less [-]

## CIV ENG 165 Concrete Materials, Construction, and Sustainability 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019

Concrete materials: cements, supplementary cementitious materials, water, and admixtures. Sustainability analysis of concrete materials and mixtures. Development of special concretes: self-leveling concrete, high-performance concrete, and mass concrete. Consideration of sustainability of concrete construction methods used for buildings, highways, airfields, bridges, dams and other hydraulic structures. Non-destructive methods. Discussion of long-term durability. Comprehensive group projects. Concrete Materials, Construction, and Sustainability: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 60

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Monteiro

Concrete Materials, Construction, and Sustainability: Read Less [-]

## CIV ENG 166 Construction Engineering 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2018

Introduction to construction engineering and field operations. The construction industry, construction methods and practice, productivity improvement, equipment selection, site layout formwork, erection of steel and concrete structures. Labs demonstrate the concepts covered. Field trips to local construction projects.

Construction Engineering: Read More [+]

### Rules & Requirements

**Prerequisites:** Upper division standing; CIV ENG 167 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Horvath

Construction Engineering: Read Less [-]

## CIV ENG 167 Engineering Project Management 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Principles of economics, decision making, and law applied to company and project management. Business ownership, liability and insurance, cash flow analysis, and financial management. Project life-cycle, design-construction interface, contracts, estimating, scheduling, cost control.

Engineering Project Management: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 93 (can be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Ibbs, Tommelein

Engineering Project Management: Read Less [-]

## CIV ENG 170A Infrastructure Sensing and Modeling 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Introduction to sensing and modeling of infrastructure system; Imagery analysis (point clouds, lidar, structure for motion, satellite); Geophysics (Synthetic-aperture radar analysis, time histories analyses); Sensor systems (distributed fiber optics, wireless sensor network, MEMS, conventional); Structural health monitoring and analysis; Infrastructure network analysis (graph theory, GIS, simulations); entrepreneurship in infrastructure and smart cities industry.

Infrastructure Sensing and Modeling: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** ENGIN 7, CIV ENG C30, and CIV ENG 93 or equivalents

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructors:** Soga , Zekkos, Kayen

Infrastructure Sensing and Modeling: Read Less [\[-\]](#)

## CIV ENG 171 Rock Mechanics 3 Units

Terms offered: Spring 2022, Spring 2020, Spring 2019

Geological and geophysical exploration for structures in rock; properties and behavior of rock masses; rock slope stability; geological engineering of underground openings; evaluation of rock foundations, including dams. Rock Mechanics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CIV ENG 70 or an introductory course in physical geology; and upper division standing in engineering

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Glaser

Rock Mechanics: Read Less [\[-\]](#)

## CIV ENG C172 Remote Sensing of the Environment 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

The course will introduce junior/senior undergraduate students to the basic physical concepts of remote sensing as they relate to different earth surface processes. It will introduce students to a variety of recently developed ground, airborne, and satellite instruments and their applications to monitor and analyze environmental processes. These include active (e.g., Lidar), and passive (radiometers) sensors, optical (e.g., Landsat, MODIS), microwave (e.g., SMAP), and gravitational (e.g., GRACE) satellites.

Remote Sensing of the Environment: Read More [\[+\]](#)

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for ESPM C172 after completing CIV ENG 172, or ESPM 172. A deficient grade in ESPM C172 may be removed by taking CIV ENG 172, or ESPM 172.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Girotto

**Also listed as:** ESPM C172

Remote Sensing of the Environment: Read Less [\[-\]](#)

## CIV ENG 173 Groundwater and Seepage 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Introduction to principles of groundwater flow, including steady and transient flow through porous media, numerical analysis, pumping tests, groundwater geology, contaminant transport, and design of waste containment systems.

Groundwater and Seepage: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Senior standing in engineering or science; CIV ENG 100 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Rubin, Sitar

Groundwater and Seepage: Read Less [\[-\]](#)

## CIV ENG 174 Engineering Geomatics 3 Units

Terms offered: Summer 2015 First 6 Week Session, Summer 2014 10 Week Session, Summer 2014 First 6 Week Session

Engineering Geomatics is a field that integrates collections, processing, and analysis of digital geospatial data. This new field is anchored in the established field of geodetics that describes the complex shape of the Earth, elements and usage of topographic data and maps. Basic and advanced GPS satellite mapping. Digital globe technology. Advanced laser-LIDAR mapping. Quantitative terrain modeling, change detection, and analysis. Hydrogeomatics-seafloor mapping.

Engineering Geomatics: Read More [+]

### Hours & Format

**Summer:** 6 weeks - 6 hours of lecture and 5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Engineering Geomatics: Read Less [-]

## CIV ENG 175 Geotechnical and Geoenvironmental Engineering 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Soil formation and identification. Engineering properties of soils. Fundamental aspects of soil characterization and response, including soil mineralogy, soil-water movement, effective stress, consolidation, soil strength, and soil compaction. Use of soils and geosynthetic materials in geotechnical and geoenvironmental applications. Introduction to site investigation techniques. Laboratory testing and evaluation of soil composition and properties.

Geotechnical and Geoenvironmental Engineering: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG C30 / MEC ENG C85 (may be taken concurrently); CIV ENG 100 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Bray, Sitar, Soga

Geotechnical and Geoenvironmental Engineering: Read Less [-]

## CIV ENG 176 Environmental Geotechnics 3 Units

Terms offered: Spring 2021, Spring 2016, Spring 2015

Principles of environmental geotechnics applied to waste encapsulation and remediation of contaminated sites. Characterization of soils and wastes, engineering properties of soils and geosynthetics and their use in typical applications. Fate and transport of contaminants. Fundamental principles and practices in groundwater remediation. Application of environmental geotechnics in the design and construction of waste containment systems. Discussion of soil remediation and emerging technologies.

Environmental Geotechnics: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 175 or consent of instructor; CIV ENG 111 and CIV ENG 173 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Sitar

Environmental Geotechnics: Read Less [-]

## CIV ENG 177 Foundation Engineering Design 3 Units

Terms offered: Spring 2017, Spring 2016, Fall 2014

Principles of foundation engineering. Shear strength of soil and theories related to the analysis and design of shallow and deep foundations, and retaining structures. Structural design of foundation elements; piles, pile caps, and retaining structures. The course has a group project that incorporates both geotechnical and structural components of different foundation elements.

Foundation Engineering Design: Read More [+]

### Rules & Requirements

**Prerequisites:** CIV ENG 175; CIV ENG 120 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Bray

Foundation Engineering Design: Read Less [-]

## **CIV ENG C178 Applied Geophysics 3 Units**

Terms offered: Fall 2022, Fall 2021, Fall 2020, Fall 2019

The theory and practice of geophysical methods for determining the subsurface distribution of physical rock and soil properties. Measurements of gravity and magnetic fields, electrical and electromagnetic fields, and seismic velocity are interpreted to map the subsurface distribution of density, magnetic susceptibility, electrical conductivity, and mechanical properties.

Applied Geophysics: [Read More](#) [+]

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### **Additional Details**

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Rector

**Also listed as:** EPS C178

Applied Geophysics: [Read Less](#) [-]

## **CIV ENG 179 Geosystems Engineering Design 3 Units**

Terms offered: Fall 2022, Fall 2021, Fall 2020

Geosystem engineering design principles and concepts. Fundamental aspects of the geomechanical and geoenvironmental responses of soil are applied to analyze and design civil systems, such as earth dams and levees, earth retention systems, building and bridge foundations, solid-waste fills, and tailings dams. Students form teams to design geotechnical aspects of a civil project and prepare/present a design document. Field trip to a project site.

Geosystems Engineering Design: [Read More](#) [+]

### **Rules & Requirements**

**Prerequisites:** CIV ENG 175

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### **Additional Details**

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Bray, Sitar, Soga

Geosystems Engineering Design: [Read Less](#) [-]

## **CIV ENG 180 Life-Cycle Design and Construction 4 Units**

Terms offered: Spring 2022, Spring 2021, Spring 2020

Course encompasses two design aspects of a civil and environmental engineering system: 1) Design of whole system, component, or life-cycle phase, subject to engineering standards and constraints, and 2) production system design (e.g., cost estimation and control, scheduling, commercial and legal terms, site layout design). Students form teams to address real-life projects and prepare project documentation and a final presentation.

Life-Cycle Design and Construction: [Read More](#) [+]

### **Rules & Requirements**

**Prerequisites:** CIV ENG 167

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### **Additional Details**

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Life-Cycle Design and Construction: [Read Less](#) [-]



## CIV ENG 186 Design of Internet-of-Things for Smart Cities 3 Units

Terms offered: Spring 2022, Fall 2019, Fall 2018

Hands-on engineering design experience for creating cyber-physical systems, or more colloquially, "internet-of-things (IoT) systems" for smart cities. Projects overlay a software layer onto physical infrastructure to produce one integrated system. Student teams will identify a challenge with current urban systems, e.g. mobility, energy & environment, water, waste, health, security, and the built environment. Student teams design and prototype an innovation that addresses this challenge using maker resources, e.g. 3D printing, laser cutters, and open-source electronics. The project will be executing via the "Design Sprint" process, which is popular in agile development and Silicon Valley. Students present projects to industry judges.

Design of Internet-of-Things for Smart Cities: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CIV ENG 191

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

**Instructors:** Moura, Sengupta

Design of Internet-of-Things for Smart Cities: Read Less [\[-\]](#)

## CIV ENG 190 Special Topics in Civil and Environmental Engineering 1 - 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

This course covers current topics of interest in civil and environmental engineering. The course content may vary from semester to semester depending upon the instructor

Special Topics in Civil and Environmental Engineering: Read More [\[+\]](#)

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Variano

Special Topics in Civil and Environmental Engineering: Read Less [\[-\]](#)

## CIV ENG 191 Civil and Environmental Engineering Systems Analysis 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

This course is organized around five real-world large-scale CEE systems problems. The problems provide the motivation for the study of quantitative tools that are used for planning or managing these systems. The problems include design of a public transportation system for an urban area, resource allocation for the maintenance of a water supply system, development of repair and replacement policies for reinforced concrete bridge decks, traffic signal control for an arterial street, scheduling in a large-scale construction project.

Civil and Environmental Engineering Systems Analysis: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CIV ENG 93 and ENGIN 7

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Bayen, Madanat, Sengupta

**Formerly known as:** 152

Civil and Environmental Engineering Systems Analysis: Read Less [\[-\]](#)

## CIV ENG 192 The Art and Science of Civil and Environmental Engineering Practice 1 Unit

Terms offered: Fall 2017, Fall 2016, Fall 2015

A series of lectures by distinguished professionals designed to provide an appreciation of the role of science, technology, and the needs of society in conceiving projects, balancing the interplay of conflicting demands, and utilizing a variety of disciplines to produce unified and efficient systems.

The Art and Science of Civil and Environmental Engineering Practice: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Senior standing in Civil Engineering

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/ Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

The Art and Science of Civil and Environmental Engineering Practice: Read Less [\[-\]](#)

## CIV ENG 193 Engineering Risk Analysis 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019

Applications of probability theory and statistics in planning, analysis, and design of civil engineering systems. Development of probabilistic models for risk and reliability evaluation. Occurrence models; extreme value distributions. Analysis of uncertainties. Introduction to Bayesian statistical decision theory and its application in engineering decision-making.

Engineering Risk Analysis: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Upper division standing

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Li

Engineering Risk Analysis: Read Less [\[-\]](#)

## CIV ENG H194 Honors Undergraduate Research 3 - 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Supervised research. Students who have completed 3 or more upper division courses may pursue original research under the direction of one of the members of the staff. A final report or presentation is required. A maximum of 4 units of H194 may be used to fulfill the technical elective requirement.

Honors Undergraduate Research: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Upper division technical GPA 3.3, consent of instructor and faculty advisor

**Repeat rules:** Course may be repeated for credit up to a total of 8 units.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3-4 hours of independent study per week

### Summer:

6 weeks - 7.5-10 hours of independent study per week

8 weeks - 6-7.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Honors Undergraduate Research: Read Less [\[-\]](#)

## CIV ENG 197 Field Studies in Civil Engineering 1 - 4 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022

Supervised experience in off-campus companies or tutoring/mentoring relevant to specific aspects and applications of civil engineering on or off campus. Written report required at the end of the semester.

Field Studies in Civil Engineering: Read More [\[+\]](#)

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of fieldwork per week

### Summer:

6 weeks - 2.5-10 hours of fieldwork per week

8 weeks - 1.5-7.5 hours of fieldwork per week

10 weeks - 1.5-6 hours of fieldwork per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Field Studies in Civil Engineering: Read Less [\[-\]](#)

## CIV ENG 198 Directed Group Study for Advanced Undergraduates 1 - 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Group study of a selected topic or topics in civil engineering.

Directed Group Study for Advanced Undergraduates: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Senior standing in engineering

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Directed Group Study for Advanced Undergraduates: Read Less [\[-\]](#)

## **CIV ENG 199 Supervised Independent Study 1 - 4 Units**

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022  
Supervised independent study.

Supervised Independent Study: Read More [\[+\]](#)

### **Rules & Requirements**

**Prerequisites:** Consent of instructor and major adviser. Enrollment is restricted; see the Course Number Guide for details

**Credit Restrictions:** Course may be repeated for a maximum of four units per semester.

**Repeat rules:** Course may be repeated for credit without restriction.

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

#### **Summer:**

6 weeks - 1-5 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

10 weeks - 1-4 hours of independent study per week

### **Additional Details**

**Subject/Course Level:** Civil and Environmental Engineering/  
Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study: Read Less [\[-\]](#)