# CE 11: SUSTAINABILITY AND INFRASTRUCTURE

## In Workflow

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## Approval Path

1. 2026-10-12T18:48:43Z
   Julie Fogarty (fogarty): Approved for CE Committee Chair
2. 2026-10-12T22:56:52Z
   Saad Merayyan (merayyan): Approved for CE Chair
3. 2026-10-23T19:05:21Z
   Tongren Zhu (tongren.zhu): Approved for ECS College Committee Chair
4. 2026-10-23T19:34:30Z
   Behnam Arad (arad): Approved for ECS Dean

### New Course Proposal

Date Submitted: 2026-09-30T05:58:19Z

### Viewing: CE 11 : Sustainability and Infrastructure

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Changes proposed by: Amir Motlagh (219703810)

**Contact(s):**

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|---|---|---|
| Amir Motlagh | motlagh@csus.edu | 9162782937 |

**Catalog Title:**
Sustainability and Infrastructure

**Class Schedule Title:**
Sustainability & Infrastructur

**Academic Group: (College)**
ECS - Engineering & Computer Science

**Academic Organization: (Department)**
Civil Engineering

**Will this course be offered through the College of Continuing Education (CCE)?**
No

**Catalog Year Effective:**
Fall 2027 (2027/2028 Catalog)

**Subject Area: (prefix)**
CE - Civil Engineering

**Catalog Number: (course number)**
11

**Course ID: (For administrative use only.)**
TBD

**Units:**
3

**Is the ONLY purpose of this change to update the term typically offered or the enforcement of existing requisites at registration?**
No

**In what term(s) will this course typically be offered?**
Fall, Spring

**Does this course require a room for its final exam?**
Yes, final exam requires a room

**Does this course replace an existing experimental course?**
No

**This course complies with the credit hour policy:**
Yes

**Justification for course proposal:**
Given the limited number of course options to satisfy GE Area 5B: Biological Science (10 courses), the civil engineering department is proposing a new course option to provide the general student body with the opportunity to learn about biological processes in a sustainability and infrastructure context. This lower-division course introduces students to biological science and sustainability through applications involving water, wastewater, stormwater, waste management, and construction. We are hoping it will be of broad interest to students as they continue to experience the consequences of past societal infrastructure choices in their everyday lives. Students will learn how infrastructure affects ecosystems and public health while exploring sustainable engineering solutions. The course fulfills the General Education Area 5-B (Biological Science) requirement and prepares students for advanced civil and environmental engineering coursework if they choose to pursue the major. We are hoping this course would serve to both attract new students and retain existing students in our major by showcasing the impact they could have as future practicing engineers. Even if students are not interested in the CE major, this course should provide students with a solid introduction to sustainability and infrastructure so that they can be well-informed members of the public.

Some math skills will be necessary for certain topics in the course. High school math should be sufficient, but we are recommending college algebra just to ensure students are not surprised once they enroll in the course. This prerequisite format is consistent with other GE courses like CHEM 6A.

**Course Description: (Not to exceed 90 words and language should conform to catalog copy.)**
Introduction to sustainability through the interactions among civil infrastructure and natural ecosystems. Examination of the roles of water, energy, nutrients, organisms, and biodiversity, and the effects of human activities and infrastructure on environmental and public health conditions. Analysis of environmental data and sustainability principles to evaluate human impacts and compare conventional, nature-based, and sustainable infrastructure strategies.

**Are one or more field trips required with this course?**
No

**Fee Course?**
No

**Is this course designated as Service Learning?**
No

**Is this course designated as Curricular Community Engaged Learning?**
No

**Does this course require safety training?**
No

**Does this course require personal protective equipment (PPE)?**
No

**Does this course have prerequisites?**
No

**Does this course have corequisites?**
No

**Graded:**
Letter

**Approval required for enrollment?**
No Approval Required

**Course Component(s) and Classification(s):**
Lecture

**Lecture Classification**
CS#02 - Lecture/Discussion (K-factor=1WTU per unit)
**Lecture Units**
3

**Is this a paired course?**
No

**Is this course crosslisted?**
No

**Can this course be repeated for credit?**
No

**Can the course be taken for credit more than once during the same term?**
No

## Description of the Expected Learning Outcomes and Assessment Strategies:

**List the Expected Learning Outcomes and their accompanying Assessment Strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers). Click the plus sign to add a new row.**

| | Expected Learning Outcome | Assessment Strategies |
|---|---|---|
| 1 | Explain the basic structure and function of ecosystems, including energy flow, carbon and nutrient cycles, and biodiversity. | Homework assignments, Quizzes, Exams |
| 2 | Describe the roles of biological processes in treating water, wastewater, solid waste, and air. | Homework assignments, Quizzes, Exams |
| 3 | Describe the relationships among civil infrastructure, human communities, public health, and natural ecosystems. | Homework assignments, Quizzes, Exams |
| 4 | Identify how urbanization and infrastructure development affect ecosystems. | Homework assignments, Quizzes, Exams |
| 5 | Interpret basic environmental and biological data used to evaluate ecosystem function, human impacts, and threats to human health in the environment. | Homework assignments, Quizzes, Exams |
| 6 | Evaluate the environmental and public health performance of selected civil infrastructure systems. | Homework assignments, Quizzes, Exams, Project |
| 7 | Compare conventional, nature-based, and hybrid infrastructure approaches using sustainability criteria. | Homework assignments, Quizzes, Exams, Project |
| 8 | Explain the role of civil engineers in managing infectious disease transmission, pollution control, resource conservation, and ecosystem protection. | Homework assignments, Quizzes, Exams |
| 9 | Communicate an evidence-based recommendation for improving the sustainability of an infrastructure system. | Homework assignments, Quizzes, Exams, Project |
| 10 | Examine techniques for adapting infrastructure to reduce harms to ecosystems (e.g., controlled floods through dams, dam removal, wildlife bridges over highways, low impact development) | Homework assignments, Quizzes, Exams, Project |

**Attach a list of the required/recommended course readings and activities:**

CE 11_Readings.pdf

**For whom is this course being developed?**

Majors in the Dept
Majors of other Depts
General Education
Other

**Is this course required in a degree program (major, minor, graduate degree, certificate?)**

No

**Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer)?**

No

**Will there be any departments affected by this proposed course?**

No

**I/we as the author(s) of this course proposal agree to provide a new or updated accessibility checklist to the Dean's office prior to the semester when this course is taught utilizing the changes proposed here.**

I/we agree

## University Learning Goals

**Undergraduate Learning Goals:**

Competence in the disciplines
Knowledge of human cultures and the physical and natural world
Intellectual and practical skills
Integrative learning

**Is this course required as part of a teaching credential program, a single subject, or multiple subject waiver program (e.g., Liberal Studies, Biology) or other school personnel preparation program (e.g., School of Nursing)?**

No

## Is this a General Education (GE) or Graduation Requirement (GR) course or is it being considered for GE/GR?

**Is this a General Education (GE) course or is it being considered for GE?**

Yes

**In which GE area(s) does this apply?**

5B. Biological Science

**Which GE objective(s) does this course satisfy?**

Find and use common information resources, engage in specialized library research, use computers and seek out appropriate expert opinion and advice.
Use mathematical ideas to accomplish a variety of tasks.
Gain a general understanding of current theory, concepts, knowledge, and scientific methods pertaining to the nature of the physical universe, ecosystems, and life on this planet.

**Attach Course Syllabus with Detailed Outline of Weekly Topics:**

CE 11_Syllabus Fall27.pdf

Syllabi must include: GE area outcomes listed verbatim; catalog description of the course; prerequisites, if any; student learning objectives; assignments; texts; reading lists; materials; grading system; exams and other methods of evaluation.

**Will more than one section of this course be offered?**

Yes

**Provide a description of what would be considered common to all sections and what might typically vary between sections:**

Learning outcomes will be consistent across all course sections, though the examples, case studies, and topic sequence may vary slightly.

**Please write a statement indicating the means and methods for evaluating the extent to which the objectives of the GE Area(s) and any writing requirements are met for all course sections:**

All course sections will be evaluated consistently using common course learning outcomes, aligned assignments, and shared assessment criteria (refer to the attached course map). Assessment tools include quantitative problem-solving assignments, case-study analyses, examinations, and a written project report requiring students to apply scientific principles, interpret evidence, and communicate conclusions clearly. Instructors will periodically review representative student work and assessment results across sections to determine the extent to which the objectives are being met and to identify appropriate curricular or instructional improvements.

**What steps does the department plan to take to ensure that instructors comply with the respective category criteria and who is responsible?**

The department chair and designated course coordinator will ensure compliance with the applicable GE category criteria. All instructors will use consistent course learning outcomes, required instructional content, and common assessment criteria. Before each semester, the course coordinator will review syllabi and major assignments for alignment with the approved course proposal and GE requirements. Instructors will submit representative student work and assessment results for periodic review. The course coordinator and department curriculum committee will evaluate these materials across sections, identify inconsistencies, and recommend necessary revisions.

## General Education - Area 5B: Biological Science

Section 1.

## Indicate in written statements how the course meets the following criteria for Area 5B. Relate the statements to the course syllabus and outline. Be as succinct as possible.

## General criteria:

**Is an introductory or survey course with no college level prerequisites.**

This is an introductory course with no college-level prerequisites. It is designed for lower-division civil engineering students and all technical concepts and analytical methods required for successful completion of the course will be introduced and developed within the course.

**Emphasizes general principles and concepts having a broad range of application and is not restricted to specialized topics.**

The course emphasizes foundational biological, ecological, public health, and sustainability principles that apply broadly across civil engineering systems. Although examples from water, wastewater, stormwater, transportation, solid waste, and resilient infrastructure are used to demonstrate these principles, the course is not limited to specialized technical topics or a particular civil engineering subdiscipline.

**Introduces students to one or more of the disciplines whose purpose is to acquire knowledge of living systems and life forms.**

The course introduces students to ecology, environmental biology, and public health biology as disciplines concerned with living systems and life forms. Students examine ecosystem structure and function, biodiversity, carbon and nutrient cycles, microorganisms, disease transmission, and biological treatment processes, and apply these concepts to understand interactions among civil infrastructure, human communities, public health, and natural ecosystems.

## Specific criteria:

**A student will be able to explain and apply core ideas and models concerning living systems and life forms, citing critical observations, underlying assumptions and limitations.**

Students will explain and apply core ecological and biological concepts, including ecosystem structure and function, energy flow, carbon and nutrient cycling, biodiversity, population dynamics, and biological treatment processes, to civil infrastructure systems. Through data analyses and case studies, students will identify relevant observations, evaluate underlying assumptions and limitations, and determine how well biological and ecological models explain infrastructure-ecosystem interactions.

**A student will be able to describe how scientists create explanations of natural phenomena based on the systematic collection of empirical evidence subjected to rigorous testing and/or experimentation.**

Students will describe how scientists develop explanations of ecological, biological, and public health phenomena through systematic data collection, evaluation of environmental datasets, and case studies. Students will examine how evidence is used to evaluate ecosystem function, biological treatment processes, infrastructure impacts, and threats to environmental and human health.

**A student will be able to access and evaluate scientific information, including interpreting tables, graphs and equations.**

Students will access and evaluate scientific information from credible sources related to ecosystems, public health, and civil infrastructure. Through course readings, case studies, and data analysis activities, students will interpret tables, graphs, maps, and basic equations; assess the quality and limitations of the information; and use the evidence to explain environmental conditions and evaluate infrastructure performance.

**A student will be able to recognize evidence-based conclusions and form reasoned opinions about science-related matters of personal, public and ethical concern.**

Students will use scientific information to form reasoned opinions on matters involving ecosystems, public health, resource use, climate resilience, and infrastructure development. Through readings, discussions, and case studies, students will consider the environmental, social, and ethical implications of infrastructure decisions and communicate recommendations supported by credible evidence.

## Includes a writing component described on course syllabus

**l) If course is lower division, formal and/or informal writing assignments encouraging students to think through course concepts using at least one of the following: periodic lab reports, exams which include essay questions, periodic formal writing assignments, periodic journals, reading logs, other. Writing in lower division courses need not be graded, but must, at a minimum, be evaluated for clarity and proper handling of terms, phrases, and concepts related to the course.**

**2) If course is upper division, a minimum of 1500 words of formal, graded writing. [Preferably there should be more than one formal writing assignment and each writing assignment (e.g. periodic lab reports, exams which include essay questions, a research/term paper etc.) should be due in stages throughout the semester to allow the writer to revise after receiving feedback from the instructor. Include an indication of how writing is to be evaluated and entered into course grade determination.]**

Students will complete both formal and informal writing assignments designed to help them examine and apply course concepts. These assignments will include brief responses to course readings and case studies, short-answer or essay exam questions, infrastructure evaluation memoranda, field (campus tour) observation reflections, and a final written project report for a civil infrastructure system. Writing will be evaluated for clarity, organization, accurate use of biological and sustainability terminology, appropriate interpretation of scientific evidence, and the logical development of conclusions. Written communication criteria will be incorporated into the grading rubrics for applicable assignments, exams, and the final project.

Section 2.

**If you would like, you may provide further information that might help the G.E. Course Review Committee understand how this course meets these criteria and/or the G.E. Program Objectives found in the CSUS Policy Manual, General Education Program, Section I.B.**

This course uses civil infrastructure as an accessible context for introducing foundational concepts from ecology, environmental biology, and public health biology. Students examine how living systems interact with water, wastewater, stormwater, transportation, solid waste, and urban development systems. The course emphasizes broadly applicable scientific principles rather than specialized engineering design.

Through readings, case studies, data-interpretation activities, discussions, field observation, and written assignments, students evaluate scientific information, interpret tables and graphs, recognize assumptions and limitations, and develop evidence-based conclusions. Students also consider the public health, environmental, social, and ethical implications of infrastructure decisions. These activities support the GE Program Objectives by strengthening scientific literacy, critical thinking, written communication, and students' ability to make informed decisions about science-related matters affecting their communities.

**Please attach any additional files not requested above:**

CE 11_Course map.pdf

Key: 15614