TO: The Academic Senate

FROM: Committee on Instruction and Curriculum (CIC)

SUBJECT: 16-17 CIC 54: Revision request for B.S. Environmental Science

PURPOSE: Information to the Academic Senate

ACTION REQUESTED: That the Senate accept the information that the revision request for bachelors of science in Environmental Science has been approved by CIC.

BACKGROUND INFORMATION:
The Senate process for approving transformed degree programs for the semester calendar is defined by 14-15 CIC 36. The Committee discussed the B.S. in Environmental Science at its January 9, 2017 meeting, which was attended by Associate Dean Danika LeDuc on behalf of the Department of Earth and Environmental Sciences. It was approved by CIC unanimously with the acknowledgement that some non-substantive changes may occur in the Catalog copy. The Committee recommends the following changes to the Catalog copy. The program should use a better phrase than “Required courses for students selecting No Concentration” (some suggestions were proposed by the Committee).

In the roadmap, the A2 course should be listed as ENGL 102. There was no listing for the required “Writing 2” course (ENGL 200) in the roadmap. One of the code classes may double-count with an area of GE. (So, even though adding writing 2 would appear to increase the unit total above 120, this reduces the units by the same amount.) The total units should be 120, not 119; the program may need to add a one-unit elective for those taking the minimum unit route to the degree.

The proposal may be viewed within Curriculog; the summary is attached as a PDF document per ExCom’s request.
B.S. Environmental Science

2. Semester Conversion Request for Approval of Revision of the Undergraduate Degree Program/Major

General Catalog Information

***READ BEFORE YOU BEGIN***

Use this form to request a revision to your Undergraduate Degree Program/Major and its concentration(s).

To change the title of your degree program, a narrative will need to be submitted to APGS for review by CIC and the state chancellor's office. Click here to submit your narrative.

To move an existing degree to online, complete form #7. Semester Conversion Request for Online/Hybrid Program Modification.

To elevate an option to a degree or change the degree type, a narrative will need to be submitted to APGS for review by CIC and the state chancellor's office, Click here to submit your narrative.

Turn on Help Text by clicking the Show Help Text icon above this section of the form.

Effective Term: Fall 2018

Catalog: 2018-2019

Select Shared Core unless otherwise instructed by APGS

Notes: If you want to move an existing degree program to online (i.e. 50% or more of the program can be completed online (a hybrid course counts as .50 online), elevate an option to a degree, or change the degree type, please e-mail Donna Wiley, Interim Associate Vice President, Academic Programs and Graduate Studies; and copy Sarah Aubert, Catalog and
Curriculum Specialist, Academic Programs and Graduate Studies, for additional instructions as soon as possible.

<table>
<thead>
<tr>
<th>Department: *</th>
<th>Department of Earth and Environmental Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full and exact title of Major including degree earned: *</td>
<td>B.S. Environmental Science</td>
</tr>
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</table>

Has your program received transformation funding? *

- Yes
- No

If the program received transformation funding, please summarize the transformative changes made:

In addition to "course level" transformations of several of our courses to focus on active, student-centered learning, we have made "program level" transformations focused on providing students with more field-based experiences (since environmental science is an interdisciplinary field science, where practitioners work both inside and outside of a laboratory). In order to make efficient use of departmental and program resources, these field experience modules have been designed to work in concert with field modules designed for the Geology degree.

Two other "program level" transformations include the elimination of our existing three options in favor of a "design your own concentration" elective-based approach, and the addition of a concentration in Environmental Health focusing on the human health aspects of environmental science (prior to quarter-to-semester conversion, this degree was in the Department of Health Sciences). Opening up the existing options will allow students more flexibility in designing their major, will hopefully decrease time to graduation, and will decrease complexity of the academic program.

The addition of the Environmental Health concentration will hopefully allow students to attain Registered Environmental Health Specialist certification with the State of California; CSUEB would become the only school in the region to offer a program of this nature. We have worked closely with the Department of Health Sciences and the College of Science in order to make this concentration a successful transition.

The transformed program will effectively prepare our students for a variety of careers, as well as for subsequent academic studies.

Program Description
Environmental science is an interdisciplinary field, focusing on the study of physical, chemical, and biological processes that underpin both natural ecosystems and human-influenced systems. While their focus is often on the physical and life sciences, environmental scientists must also be mindful of social issues, political context, economic factors, and human well-being in order to understand environmental issues and address environmental problems. The coursework for the Environmental Science degree reflects this broad, systems-level approach, with coursework in science and mathematics, as well as the social sciences. This allows students to gain a deeper understanding of the science and social issues involved in addressing complex environmental problems such as environmental contamination, access to food and safe drinking water, and climate change.

The undergraduate degree program in Environmental Science includes a core of required courses intended to provide students with an understanding of the fundamental principles of biology, chemistry, geology, mathematics, physics, and statistics necessary to understand environmental challenges. In addition, further required courses and electives allow students to apply this fundamental knowledge to broader environmental issues and problems, and to deepen their understanding of natural systems, human systems, and sustainability. The Environmental Science B.S. program serves as preparation for employment in a variety of related fields, both in technical and policy/management roles requiring extensive technical knowledge and background. Due to the breadth of disciplines involved in environmental science, students wishing to do independent work professionally may wish to consider graduate study in a field of specialization, if further training is required for their chosen path.

The Environmental Science B.S. with a concentration in Environmental Health focuses on environmental hazards impacting human health (toxic and hazardous substances, physical and biological hazards, etc.) The concentration in Environmental Health prepares students for employment as Registered Environmental Health Specialists in the State of California.

The Department of Earth and Environmental Sciences offers undergraduate study leading to the Bachelor of Science degree in Environmental Science, focusing on developing strong foundational knowledge and a broad set of field and laboratory skills that allow students to seek employment, or prepare them for continued academic study in the Earth and environmental sciences.

The Bachelor of Science (B.S.) program is designed to prepare students for:

Entry-level employment as environmental scientists in government (city, county, regional, state, and federal), and in private industry (environmental consulting, water and
wastewater treatment, environmental health and safety, hazardous materials management, environmental remediation, etc.)
Graduate study in environmental science, Earth science, Earth systems science, environmental chemistry, climate science, etc.

The undergraduate Environmental Science program emphasizes field and laboratory training. Many opportunities for field- and laboratory-based research exist throughout Northern California and elsewhere. Our B.S. program reflects departmental expertise by focusing on issues important to the local and regional communities, such as water availability, water quality, soil remediation, environmental impacts of urban and agricultural communities, and coastal issues of importance to the San Francisco Bay region and the State of California. Rigorous coursework is augmented by field experiences that allow students to synthesize classroom concepts in natural laboratories. Seminars and topical courses address diverse subjects, for example: water contamination, sustainable management of food waste, hazardous waste management, and human use of groundwater and surface water. We maintain strong connections with East Bay Regional Parks, the California Environmental Protection Agency, Lawrence Livermore National Laboratory, NASA Ames, the U.S. Geological Survey in Menlo Park, and SLAC National Accelerator Laboratory.

Students with strong records in the B.S. degree may be able to engage in guided, individual research projects, working with faculty on their research. Students wishing to pursue a senior thesis should make contact with a faculty advisor at least one full semester in advance to discuss topic and feasibility.

The Earth & Environmental Science Club, a student-run organization, sponsors a variety of activities including guest speakers, field trips, employment workshops, and student-faculty gatherings. The club is an important part of department life, providing students with opportunities to make professional contacts, to explore graduate school and professional options, and to enjoy the company of others with similar interests.

**Career Opportunities**

Environmental health and safety specialist
Environmental chemist
Hydrologist
Hazardous waste management specialist
Park ranger
Analytical laboratory technician
Drinking water treatment technician
Wastewater treatment specialist
Environmental policy, planning, and management
Environmental remediation specialist
Environmental analyst

Program Learning Outcomes

Students graduating with a B.S. in Environmental Science will:

I. Demonstrate foundational knowledge of Earth processes, natural systems, and the effects of human activity (*Knowledge*)

ILOs: 1, 5, 6

Identify key components of the Earth system, and describe the physical, chemical, and biological processes by which Earth systems interact on a variety of scales.
Apply an interdisciplinary understanding of biology, geology, chemistry, physics, mathematics, and statistics to understanding environmental issues.
Articulate the impacts of humans on the environment, and the roles of humans in avoiding, mitigating, or remediating environmental impacts.
Articulate the relationship between scientific findings, the impact of humans on the environment, and the concept of sustainability.

II. Develop fundamental field, laboratory, and computer skills necessary for environmental science (*Skills*)

ILOs: 1, 2, 3, 4, 6

Identify key geologic materials and organisms, and describe their features and importance in the environment.
Perform basic field and laboratory-based tasks such as chemical analysis, physical analysis, data collection, statistical analysis, and data analysis using standard techniques and equipment.
Demonstrate competency with basic computational tools and software for data collection, analysis, and effective communication. Collaborate effectively with others to accomplish tasks in field and laboratory settings.

III. Critically evaluate, analyze, and integrate scientific findings, data, and socioeconomic context to understand environmental issues *(Analysis and synthesis)*

ILOs: 1, 2, 3, 5, 6

Critically read, analyze, and critique research literature, popular literature, and scientific data from an interdisciplinary scientific and quantitative perspective. Articulate the socioeconomic context relevant to environmental issues, including environmental impacts on diverse and vulnerable populations, and environmental justice. Integrate scientific findings and socioeconomic context to synthesize an interdisciplinary understanding of environmental issues. Understand the complex relationships between local and global needs, and the relationship between human actions and consequences at local and global scales.

IV. Effectively communicate in oral and written form, and develop collaborative skills *(Communication)*

ILOs: 1, 2, 3, 4, 6

Present positions on environmental issues clearly in written form, using words, graphs, tables, and figures as appropriate. Communicate effectively in oral form, using prepared presentations. Understand the importance of considering competing or contrary viewpoints, as a fundamental part of the scientific process. Function responsibly as a member of a diverse team, demonstrating professionalism and effective communication.
between team members.

V. Understand the role of the environmental science in local, regional, and global sustainability, and the role of an ethical scientist (*Sustainability and global thinking*)

ILOs: 1, 3, 5, 6

Articulate Earth’s place in the Universe, global-scale processes such as climate change, and the interactions of Earth systems with human systems.
Understand the roles and impacts of society and technology on resource use and sustainability (environmental, economic, and social) at local, regional, and global scales.
Apply knowledge and skills in a responsible, professional, and ethical manner, with an awareness of potential consequences at multiple scales.

VI. In addition, students pursuing a concentration in Environmental Health will be able to synthesize scientific and technical knowledge and skills, and knowledge of policy and society, to articulate solutions to environmental hazards (toxic substances, climate change, etc.) impacting human health.

Click here to see instructions before completing the following Major Requirements field.

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**Environmental Science**

Lower-division core courses focus on fundamental biological, chemical, geological, mathematical, and physical concepts. In addition, lower-division core courses introduce the application of fundamental knowledge to understanding Earth systems and environmental systems.
Lower Division core (34 units):

ENSC 240 Environmental Biology
ENSC 241 Environmental Biology Laboratory
ENSC 280 Humans and the Environment in California
ENSC 297 Introductory Field Experience
GEOL 210 Physical & Environmental Geology
CHEM 111 General Chemistry I
CHEM 112 General Chemistry II
PHYS 125 Principles of Physics I
PHYS 126 Principles of Physics II
MATH 130 Calculus I

Upper Division Core (19 units):

BIOL 350 Ecology
ENVT 410 Environmental Impact Analysis
ENSC 397 Advanced Field Experience
ENSC 499 Capstone Seminar

And one of:
ENSC 350 Environmental Hydrology
GEOL 432 Hydrogeology

And one of:
STAT 303 Statistical Methods in Biology
STAT 310 Statistical Methods in the Social Sciences

Required courses for students selecting No Concentration (18-21 Units):

One course from (3 units):
GEOG 225 Fundamentals of GIS
ENSC 260 Introduction to GIS in Earth and Environmental Sciences

And one from (3-4 units):
ENSC 414 Hazardous Waste Management
ENSC 420 Global Change
ENSC 497 Topics in Environmental Science

And one from (3-4 units):
ECON 360 Environmental Economics
ENGL 342 Environmental Literature
ENVT 330 Environment, Sustainability, and Social Justice
HSC 340 Climate Change and Public Health
POSC 344 Environmental Law
POSC 411 Public Policy and the Environment
SOC 330 Environmental Sociology

**Depth Electives (9-10 units):**
BIOL 433 Environmental Microbiology
BIOL 454 Biology of the Fungi
BIOL 469 Conservation Biology
CHEM 220 Quantitative Analysis
CHEM 331 Organic Chemistry I
CHEM 425 Environmental Chemistry
ENVT 345 Energy, Sustainability, and Society
ENVT 455 Sustainable Food Systems
ENVT 480 Social Impact through Sustainable Solar Design
GEOG 425 Advanced GIS
GEOL 311 Geomorphology
GEOL 360 Mineralogy and Optical Mineralogy
GEOL 371 Sedimentary Geology and Stratigraphy
GEOL 460 GIS for Earth and Environmental Sciences
HSC 300 Environmental Health
HSC 460 Emergency Preparedness and Response
ENSC 633 The Science of Soils
ENSC 634 Biogeochemistry
*(Or other courses by advisement)*

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**Environmental Health Concentration (optional)**

The Environmental Health concentration has a substantially restricted list of course requirements, intended to satisfy the California Registered Environmental Health Specialist (REHS) Option V certification pathway. The concentration requires certain specific courses in both the lower and upper division.

**Required courses for the Environmental Health concentration (28 units):**

BIOL 230 Introduction to Clinical Microbiology
CHEM 233 Fundamentals of Organic Chemistry
ENSC 414 Hazardous Waste Management
HSC 130 Health Humanities
HSC 300 Environmental Health
HSC 330 Epidemiology
HSC 362 Environmental Health Policy

Electives (6 units):

Any two of:
HSC 385 Vector Control
HSC 405 Toxicology
HSC 420 Occupational Health
PHYS 305 Environmental Health Science Electromagnetic and Nuclear Radiation
ENSC 433 The Science of Soils

Total Units Required

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Total Units should not exceed **120 Semester Units** unless previously approved by Chancellor’s Office for exemption.

**B.A. Programs:** Major requirements are a minimum of 24 units with at least 12 upper division units.

**B.S. Programs:** Major requirements are a minimum of 36 units with at least 18 upper division units.

See [Unit Calculator](https://csueastbay.curriculog.com/proposal:3005/print) for assistance.

**Additional Notes/Information**

i. Students can choose either of ENSC 350 or GEOL 432 to fulfill the hydrology core requirement. If a student fulfills the core requirement with ENSC 350, GEOL 432 can be counted as an elective.

ii. Students who have taken BIOL 140B can count this in place of ENSC 240 and ENSC 241 (Environmental Biology and Laboratory). This is so that students who have taken Biology courses but decide later to declare a major in Environmental Science do not have to repeat content. In general, BIOL 140B will **not** be recommended for Environmental Science majors since BIOL 140A is a prerequisite, and that material is not required for majors.

iii. Students in the Environmental Health concentration can count CHEM 230 or CHEM 331 in place of CHEM 233.

If the program has a [similar transfer model curriculum (TMC)](https://csueastbay.curriculog.com/proposal:3005/print), please e-mail Kyle Burch, Articulation Officer, Academic Programs and Graduate Studies, to verify that the revised
program meets the TMC requirements prior to submitting the program revision request form.

Is the major approved as a "similar" degree under the STAR Act (SB 1440)?

- Yes
- No
- I'm not sure (Articulation Office will contact you)

If yes, explain how this modification will affect the "similar" degree agreement

Were any concentrations (options) discontinued?

- Yes
- No

If yes, please explain below. If no, please enter "N/A" or "not applicable."

The program currently has three options (listed in alphabetical order), of which students are required to choose one: "Environmental Systems and Resource Management," "Life Science," and "Physical Science."

All three will be discontinued for quarter-to-semester conversion, in favor of an "open" elective process where students (with advising) choose courses that fit their personal and professional goals. A selection of possible elective courses has been included in this program form, but the included list is by no means exhaustive. Only courses listed in Curriculog, or others according to consulting departments, at the time of program entry are included in the electives list.

Is this major approved as an online degree program?

- Yes
- No

If no, is there any pathway in the revised degree that is more than 50% online?

- Yes
- No

Resource implications of the proposed revision, if any:

At least one field course is already required for the Environmental Science major, and it will be augmented with other modular field experiences (described under "transformative changes"). Transportation for these
courses is already accounted for with A2E2 fees, which will be requested when necessary. For field experiences that require lodging, food, etc., students will be charged a course fee.

**Relationship of Revised Program to requirements for teaching credentials, accreditation, and/or licensing, if any:**

Program revision will hopefully enable students in the Environmental Health concentration to attain Registered Environmental Health Specialist (REHS) certification with the State of California. (This will require further work with the State and the Department of Health Sciences here in campus.)

### Consultation with other affected departments and programs:

- The following department(s) has (have) been consulted and raised no objections:
  - Department of Anthropology, Geography and Environmental Studies
  - Department of Health Sciences

- The following department(s) has (have) been consulted and raised concerns:

  - No objections raised from consulted departments.

### Attachments

Please scroll to the top of this form and select the *Files* icon to attach the following documents to your proposal:

- [Bachelor's Degree Roadmap](#)
- [Curriculum Map 1 - PLOs to Courses](#)
- [Curriculum Map 2 - PLOs to ILOs](#)
- [Five Year Assessment Plan](#)

### Catalog Item Types

*Did you attach your Curriculum Maps, Five Year Assessment Plan or other supporting documents to this proposal?*

- Yes
- No

https://csueastbay.curriculog.com/proposal:3005/print
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### Steps for B.S. Environmental Science

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Date Completed: 5/2/2016 6:49 PM  
Changes: No  
Comments: Yes |

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Changes: Yes  
Comments: Yes |

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| - Michael Massey 5/3/2016 12:02 PM  
- Sarah Aubert (System Administrator) 5/3/2016 12:22 AM | Required for Approval: 100% required  
Date Completed: 5/3/2016 12:02 PM  
Changes: Yes  
Comments: Yes |

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Jason Smith 5/3/2016 2:45 PM

Activity

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Date Completed: 5/3/2016 2:45 PM
Changes: No
Comments: Yes
Signature: Yes

Originator

Participants

Michael Massey 5/3/2016 3:21 PM

Activity

Required for Approval: 100% required
Date Completed: 5/3/2016 3:21 PM
Changes: No
Comments: Yes

Department Chair

Participants

Jean Moran 5/3/2016 5:08 PM

Activity

Required for Approval: 100% required
Date Completed: 5/3/2016 5:08 PM
Changes: No
Comments: Yes

Dean's Office Review

Participants

Danika LeDuc 5/4/2016 12:14 PM
Jason Singley 5/5/2016 3:10 PM

Activity

Required for Approval: 100% required
Date Completed: 5/5/2016 3:10 PM
Changes: No
Comments: No
## College Curriculum Committee Approval

**Participants**
- **College of Science Curriculum Committee**
  - Science CCC - May 10, 2016
  - Anne Kotchevar * 5/13/2016 10:17 AM
  - Jason Singley * 5/17/2016 10:14 AM

**Activity**
- Required for Approval: 50% required
- Date Completed: 5/17/2016 10:14 AM
- Changes: Yes
- Comments: Yes
- Agenda: Yes

* Agenda Administrator

## Dean's Office Approval

**Participants**
- Jason Singley 5/17/2016 10:17 AM

**Activity**
- Required for Approval: 50% required
- Date Completed: 5/17/2016 10:17 AM
- Changes: No
- Comments: No

## Articulation Officer Review

**Participants**
- Kyle Burch 5/17/2016 3:57 PM

**Activity**
- Required for Approval: 100% required
- Date Completed: 5/17/2016 3:57 PM
- Changes: No
- Comments: No

## APGS (Technical Review)

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<td>👍 Maureen Scharberg 10/24/2016 9:14 PM</td>
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<td>👍 Donna Wiley 10/25/2016 2:09 PM</td>
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## Academic Senate

**Participants**
- Academic Senate
  - Sophie Rollins *

**Step Details**
- Required for Approval:
- 100% required
- Work: comment
- Agenda: Yes
- * Agenda Administrator

## President's Office

**Participants**
- Academic Senate
  - Sophie Rollins *

**Step Details**
- Required for Approval:
- 100% required
- Work: comment
- Agenda: Yes
- * Agenda Administrator

## APGS (Final Review & Export)

**Participants**
- Sarah Aubert
- Stephanie Matsuda

**Step Details**
- Required for Approval:
- 100% required
- Work: edit, comment
Attachments for B.S. Environmental Science

**curr-map-1.docx** (uploaded by Michael Massey, 5/2/2016 6:44 pm)

**curr-map-2_ENSC_PLO-to-ILO.docx** (uploaded by Michael Massey, 5/2/2016 6:45 pm)

**ENSC_bacc-degree-roadmap.xlsx** (uploaded by Michael Massey, 5/2/2016 6:45 pm)

**EdRequirements 11-2011.pdf** (uploaded by Michael Massey, 5/2/2016 6:46 pm)

**Environmental Health Concentration v3 May 2016_APGS edit 10.07.2016.xlsx**
(uploaded by Stephanie Matsuda, 10/7/2016 1:27 pm)

**ENSC_no concentration_bacc-degree-roadmap_APGS edit 10.07.2016.xlsx** (uploaded by Stephanie Matsuda, 10/7/2016 1:47 pm)
### Comments for B.S. Environmental Science

**Mitch Watnik**

1/9/2017 4:53 pm  
This program was approved unanimously by CIC on January 9 and documented this with 16-17 CIC 54.

The Committee recommends the following changes to the Catalog copy. The program should use a better phrase than "Required courses for students selecting No Concentration” (some suggestions were proposed by the Committee).

In the roadmap, the A2 course should be listed as ENGL 102. There was no listing for the required “Writing 2” course (ENGL 200) in the roadmap. One of the code classes may double-count with an area of GE. (So, even though adding writing 2 would appear to increase the unit total above 120, this reduces the units by the same amount.) The total units should be 120, not 119; the program may need to add a one-unit elective for those taking the minimum unit route to the degree.

**Donna Wiley**

10/25/2016 2:11 pm  
The proposal needs the number of units to be added following each course.

**Anne Kotchevar**

5/13/2016 10:17 am  
Unanimously approved by the College of Science curriculum committee

**Jean Moran**

5/3/2016 4:54 pm  
Replace HSC 400 with new, upper division, policy-focused course created by HSC (pending).

**Michael Massey**

5/3/2016 3:21 pm  
Adjusted Environmental Health concentration based on suggestions from Jason Smith (phone conversation), added assessment plan attachment.

**Jason Smith**

5/3/2016 2:45 pm  
Mike, sending back to you following our conversation..

**Michael Massey**

5/3/2016 12:02 pm  
Five-year assessment plan is pending (though proposed courses to assess are listed in the curriculum map).

**Michael Massey**

5/2/2016 6:54 pm  
Sent to Jason Smith of HSC for comment/approval.
**Decision Summary for B.S. Environmental Science**

Committee on Instruction and Curriculum

Status: Working

**Step Summary**

This step requires 100% approval from all participants to move forward.

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</tbody>
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Need to make a change.

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