TO: The Academic Senate
FROM: The Committee on Instruction and Curriculum
SUBJECT: 15-16 CIC 3: Approval of GEOL 3080 Hands on Earth Science Lab for B6 GE
PURPOSE: For approval of the Academic Senate.
ACTION REQUESTED: That the Academic Senate approve the request for B6 GE designation for GEOL 3080 Hands on Earth Science Lab

BACKGROUND INFORMATION:
At GE’s April 13, 2015 meeting, the subcommittee considered the request for B6 GE designation from the Earth & Environmental Sciences department for the GEOL 3080 Hands on Earth Science Lab course. GE approved the request.
Application for General Education Credit
for Upper Division Science (B6)

Course title      Hands On Earth Science Laboratory      Course number GEOL 3080

Courses approved for general education credit must provide students with explicit instruction in the approved student learning outcomes. Please be as specific as possible, describing topics, readings, assignments, activities and assessments that illustrate how the course meets the requirements. Attach the course syllabus and any assignments or assessments needed to support your explanations.

Please use this template as a guide to address ALL of the following learning outcomes.

Goal of upper division science: upper division physical, life, or interdisciplinary science GE courses build upon scientific principles and quantitative skills gained in lower division science and quantitative reasoning courses. Students must complete their lower division B1-5 requirements prior to taking their B6 course. Students are strongly encouraged to take any lab associated with the upper division course. Courses meeting the B6 requirements must support students’ acquisition of advanced numeracy, information literacy, and critical thinking competencies.

1. Students will demonstrate advanced and/or focused science content knowledge in a specific scientific field using appropriate vocabulary and referencing appropriate concepts (such as models, uncertainties, hypotheses, theories, and technologies).

Students will demonstrate science content knowledge in three ways. First, students will learn the background information needed to facilitate one of several “science stations” during visits by K-8 classes to CSUEB. They will communicate with the K-8 students in asking probing questions and answering children’s questions. In this, they will need to use appropriate vocabulary and concepts as they help deepen the science content knowledge of the K-8 teachers. Second, they will maintain a journal in which they will reflect on the connections between their science stations and concepts being taught, alternative ideas on teaching the concepts, and connections to the Next Generation Science Standards. Third, their own understanding of the science content knowledge will be assessed by comparison of a pre-test and post-test. Examples of specific concepts covered in the course include petrology, plate tectonics, geologic hazards (volcanoes and earthquakes), meteorology, climate change, coastal processes, ocean circulation, and solar system astronomy.

2. Students will apply advanced quantitative skills (such as statistics, algebraic solutions, interpretation of graphical data) to scientific problems.

Students will use algebra and interpretation of graphical data in the course. At the density station, students will challenge children to suspend a small vial with sand in water. One of the stations will demonstrate the buoyancy of air in the atmosphere as a function temperature. Students will use the ideal gas law (PV=nRT) to understand the relationships between pressure, temperature, volume and density in air. Earth science problems commonly use large databases such as climate data. Students will learn to interpret graphical data derived from large data sets related to climate change and how the atmosphere circulates.

3. Students demonstrate understanding of the nature of science and scientific inquiry and the experimental and empirical methodologies utilized in science to investigate a scientific question or issue.
The Next Generation Science Standards incorporate scientific and engineering practices that articulate the methodology used in science (and engineering). In this course, students will practice and develop their ability to use these practices. Students will develop an appreciation of the scientific method through their own practice in using it and in helping K-12 students develop their own. In particular, they are asked to estimate, predict, observe, hypothesize, analyze, interpret, and reason at the science stations.

4. Students will critically analyze scientific claims and data.

Students will assist children in writing conclusions for each science station. The format of the conclusions uses the C-E-R model: claim, evidence, and reasoning. Students will help children form a claim based on the experiments they conducted at the science station. They will review the evidence they have collected in the course of the experiment that supports their claim as well as any prior knowledge needed. In the reasoning section, the students will assist the children in making a logical interpretation of their evidence. The students will also have the opportunity to listen to the children’s explanations and, when there are logical flaws in their reasoning, guide them to ways that they could test their beliefs.

5. Students will apply science content knowledge to contemporary scientific issues (e.g. global warming) and technologies (e.g. cloning), where appropriate.

Two key features of the Next Generation Science Standards that are applicable to this learning outcome are the emphasis on engineering design practices and technological applications. These will necessarily be present in this course. Course content will incorporate contemporary issues related to global change, resources, and environmental issues.

6. How does your course support students’ acquisition of advanced information literacy skills?
(See description below.)

In order to support the acquisition of advanced information literacy skills, students will be challenged to facilitate a science station during classroom visits and to give constructive feedback to their peers in practice sessions. To do this effectively, students will need to increase their science content knowledge and confidence in communicating it. As such, they will need to draw on their own observations, prior knowledge, and outside sources for both science content information and topics such as research-based instructional models. Through their journals and oral communication with their peers and children, they will share the choices they made while facilitating the stations, how they fielded questions, and their ideas for teaching the concepts and improving the stations.

7. How does your course support students’ development of advanced critical thinking skills?
(See description below.)

This course will support the development of advanced critical thinking skills in three ways. Students must learn science content, but also must be able to plan how they will conduct their station with K-8 students, provide constructive feedback to their peers during practice sessions, and reflect on their own growth as both a student and educator in science. At all times, they will be constantly deepening their science content as they are questioned by their peers and K-8 students and helping them develop their own understanding and evaluate their own data. In all cases, both
students and K-8 students will need to follow a deductive path in order to make and support valid claims using the C-E-R format.

In addition, courses receiving upper division science approval must support students’ acquisition of advanced numeracy, information literacy, and critical thinking skills. Outcomes are attached.

### General Education

**Advanced Information Literacy Outcomes for GE Areas**

<table>
<thead>
<tr>
<th>B6</th>
<th>Outcomes for Advanced Information Literacy in Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4</td>
<td>Outcomes for Advanced Information Literacy in the Social Sciences</td>
</tr>
</tbody>
</table>

(approved by Academic Senate 2/05)

Information Literacy is a prerequisite for lifelong learning. It enables learners to engage critically with content, extend their knowledge, assume greater control over their own learning and become self-directed learners.¹

Whether taught within a specific discipline or in a multi-disciplinary context, advanced information literacy curricula should encourage students to seek multiple perspectives and use diverse sources of information to inform conclusions. Further, students should develop an understanding that information and knowledge in any discipline is in part a social construction and is subject to change as a result of ongoing dialog and research. Teaching advanced information literacy helps students understand and participate in this scholarly conversation.

Faculty can enhance student information literacy by providing problem- or inquiry-based assignments where learning results from the use of multiple information sources thereby encouraging self-directed learning and critical thinking. The development and evaluation of these types of assignments may require significant commitment and investment of time on the part of students and faculty alike.

In addition to the lower division information literacy outcomes, students who are information literate at the advanced level are able to:

1. identify the main disciplines, fields, and organizations which generate and publish knowledge in their area of research,
2. develop in-depth knowledge of the literature from the above information producers in their area of research,
3. evaluate the significance and validity of information found, both in the context of the disciplines and fields consulted, and also within their own knowledge base and value systems,
4. analyze the implications of research and publishing patterns in their area of research,
5. formulate and reformulate research inquiries based on the objectives above and,
6. demonstrate their ability to perform the above objectives when they communicate the results of their inquiry to others.

¹ This quote and other ideas contained here are drawn from the Council of Australian University Librarians’ *Information Literacy Standards*, (Canberra, 2001) and from *Learning for Life: Information Literacy Framework & Syllabus* published by the Queensland University of Technology Library (Brisbane, 2001).
Upper Division Critical Thinking Across the Curriculum

GOALS
Overall, the goals for critical thinking in the upper division would be essentially the same as the goals enumerated for the lower division, but would entail more complex and sophisticated ways of using those same skills. These goals would include:

- The general ability to use reason (both inductive and deductive)
- The ability to identify fallacious reasoning
- The ability to present one’s own original argumentation

These skills will be reflected in the upper division not as specific testing and evaluation on argumentation skills, but argumentation skills in practice within a particular discipline or disciplines. These upper division skills would include:

- The ability to weigh proffered evidence
- The ability to uncover the implicit assumptions of others
- The ability to reconstruct and evaluate complex arguments encountered in the course of reading and discussion within the discipline(s)
- The ability to frame one’s own positions logically and coherently
- The ability to construct one’s own persuasive arguments in support of carefully considered positions
- The ability to defend this position against thoughtful objections
- The practice of thinking and arguing in the mode of a practitioner of a particular discipline or disciplines
- The practice of applying the special concepts and theories developed in the particular discipline or disciplines

The goals of upper division critical thinking should be to develop these abilities.

ASSESSMENT:
Various strategies could be used to measure these goals. Instructors will be able to witness and evaluate these abilities within the proper realm of the discipline(s), and through written, oral, and discussion assignments.
Hands-On Earth Science
GEOL 3080
Department of Earth & Environmental Sciences
California State University, East Bay

Contact Information
Professor Jeffery C. Seitz
Office: 350 N. Science Building
Lab: 253 N. Science Building
Phone: (510) 885-3438 office
       (510) 885-3486 departmental office
       (510) 885-2425 fax
Email: jeff.seitz@csueastbay.edu
Office Hours:

Text
GEOL 3080 Intern Manual available from the bookstore. Other online materials will be assigned.

Course Requirements
Lab Participation 30%
Discussion (Debrief) Participation 30%
Journal 20%
Homework exercises 10%
Surveys 5%
Final Exam 5%

Course Policies
Homework: Homework must be submitted on the due date. Points will be deducted from late homework assignments (10%/day).

Exams: Examinations must be taken as scheduled. If for some reason beyond your control you cannot take an exam on time, please contact me and present a request for an excused absence. An unexcused missed exam will receive a failing grade.

Grade Policy: The grading scheme will be based on a straight scale as follows (no curve):
90-100% A
80-89%  B
70-79%  C
60-69%  D
A grade of “incomplete” can only be given if a major portion (> 50%) of the course has been completed at a passing level (“C” or better) and you have made prior arrangements for an “I” with the instructor.

Dress Code/Safety Notes
You will be working with children and their teachers in a public setting. You will be expected to dress at the same level of professionalism as you would at a school site. Closed-toe shoes are required at all times in the laboratory. Safety glasses or goggles must be worn during all laboratory work. Long hair should be tied back. You will be provided with a lab coat. Further details on safety guidelines provided on the first day of lab must also be observed for the duration of the quarter.

**Course Policy**

Lab and debrief participation is mandatory. If a student is unable to attend either, the instructor should be notified of the absence immediately upon their return to class, if not earlier. If a valid excuse is discussed with the instructor, the student may be given an alternate assignment and granted credit. Journal entries should be completed and handed in upon the student’s return to class. If the absence is not excused, zero points will be assigned for participation. *A maximum of one absence can be excused per quarter.*

Journal entries are due at the start of the period. Points will be deducted from late journal entries (10% per day).

**Communications:**

Blackboard is the official means of communication for the University. It is expected that you check both blackboard and your student e-mail regularly, as you are responsible for information and announcements that will be sent to you from the University.

Academic Dishonesty: By enrolling in this class the student agrees to uphold the standards of academic integrity described at www20.csueastbay.edu/academic/academic-policies/academic-dishonesty.html

Students found guilty of cheating on an exam or quiz or submitting work other than his/her own will receive an F for that work, and an “Academic Dishonesty Incident Report” will be filed with the Academic Affairs Office. The student will receive a copy of the report.

If you have a documented disability and wish to discuss academic accommodations, or if you would need assistance in the event of an emergency evacuation, please contact me as soon as possible. Student with disabilities needing accommodations should speak with the Accessibility Services.

CSUEB is committed to being a safe and caring community. Your appropriate response in the event of an emergency can help save lives. Information on what to do in an emergency situation (earthquake, electrical outage, fire, extreme heat, severe storm, hazardous materials, terrorist attack) may be found at www20.csueastbay.edu/af/departments/risk-management/ehs/emergency-management/

<table>
<thead>
<tr>
<th>Week</th>
<th>Lab</th>
<th>Debrief</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, safety</td>
<td>Introduction, NGSS, pre assessment, survey</td>
</tr>
<tr>
<td>2</td>
<td>Geology</td>
<td>Practice Geology activities</td>
</tr>
<tr>
<td>3</td>
<td>Teach Geology</td>
<td>Class Visit 1</td>
</tr>
<tr>
<td>4</td>
<td>Teach Geology</td>
<td>Class Visit 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>Atmosphere and Oceans</td>
<td>Practice atmosphere and oceans activities</td>
</tr>
<tr>
<td>6</td>
<td>Teach Atmosphere and Oceans</td>
<td>Class Visit 3</td>
</tr>
<tr>
<td>7</td>
<td>Teach Atmosphere</td>
<td>Class Visit 4</td>
</tr>
<tr>
<td>8</td>
<td>Planetary Science Background</td>
<td>Practice planetary activities</td>
</tr>
<tr>
<td>9</td>
<td>Teach Planetary</td>
<td>Class visit 5</td>
</tr>
<tr>
<td>10</td>
<td>Teach Planetary</td>
<td>Class visit 6</td>
</tr>
</tbody>
</table>

Schedule subject and likely to change.

**Course Learning Objectives**

1. Students will be able to demonstrate a working knowledge of the Next Generation Science Standards and implement pedagogies aligned with the standards.
2. Students will be able to identify Earth’s materials, the Earth’s structure, and explain connections to processes in the solid Earth such as plate tectonics, volcanism and earthquakes.
3. Students will be able to identify and describe the atmosphere, weather and climate.
4. Students will be able to identify and describe the structure and chemistry of the oceans.
5. Students will be able to describe the Earth in context of the solar system and universe.
6. Students will be able to describe the interactions between the different spheres in the Earth system.
7. Students will be able demonstrate analytical and quantitative skills to solve Earth Science problems.

**General Education Learning Outcomes (lower division physical science B1)**

1. Students will demonstrate advanced and/or focused science content knowledge in a specific scientific field using appropriate vocabulary and referencing appropriate concepts (such as models, uncertainties, hypotheses, theories, and technologies).
2. Students will apply advanced quantitative skills (such as statistics, algebraic solutions, interpretation of graphical data) to scientific problems.
3. Students demonstrate understanding of the nature of science and scientific inquiry and the experimental and empirical methodologies utilized in science to investigate a scientific question or issue.
4. Students will critically analyze scientific claims and data.
5. Students will apply science content knowledge to contemporary scientific issues (e.g. global warming) and technologies (e.g. cloning), where appropriate.