1. What is the theme you propose for your group of courses? In what ways do you think this theme speaks to issues important to our freshman population? To the University’s mission?

The theme of this First Year Learning Community is exploring the creative and innovative approaches to scientific problems employed by ancient cultures all over the world. Comparisons will be drawn throughout with modern scientific methods, techniques, and understanding. Stripping away some of the accumulated complexity of modern technology from problems in astronomy, engineering, and science in general has the benefit of illustrating core principles.

Another of the major themes of the cluster is the "decolonization" of science: showing that numerous diverse cultures worldwide prior to the modern era had carried out extensive and sophisticated astronomical measurements, made impressive discoveries in medicine and agriculture, and developed astounding engineering techniques. By drawing attention to the scientific achievements of diverse cultures, students who may not have originally imagined having a cultural scientific heritage might be inspired to envision themselves as scientists and explore careers and educational pathways in the sciences. By infusing diversity into scientific curriculum, we aim to address an important societal goal of expanding diversity within the ranks of Science, Technology, Engineering, and Mathematics (STEM) majors, a critical social justice issue of our time. Women, minorities, and the poor have been historically excluded from the scientific community: their voices, insights, and potential discoveries, which could have dramatically impacted all of society, have been lost. Widespread underrepresentation of women and minorities in STEM fields continues to this day, and requires pro-active measures to address.

Course work will involve hands-on projects, student presentations, calculations, and data analysis. The exciting hands-on work using ancient tools that students can build themselves will stimulate interest both in science and history, engaging first-year students in multifaceted ways.

This cluster is specifically designed to speak to important parts of the University’s mission in regards to diversity and creating culturally relevant curriculum: “Cal State East Bay welcomes and supports a diverse student body with academically rich, culturally relevant, learning experiences...”

2. List the three courses (prefix, number, title, units):

Ethnic Studies 1810 (ES 1810): American Indian Science [4 units];

Physics 1810 (PHYS 1810): Astronomy of Ancient Cultures [4 units];

Engineering 1810 (ENGR 1810): Pre-Columbian Engineering and Construction Technology [4 units].
3. Explain how the theme will be used to integrate course content in each course. If appropriate, please describe how students will be involved in researching the theme and when in the year that will happen.

The content of each course in the cluster has been newly designed specifically around the cluster theme: to reveal the complexity, diversity, and sophistication of non-western cultures. Each course explores different aspects of science and engineering from ancient cultures around the world, with a particular emphasis on native North and South American societies. Hands-on projects, presentations, reports, experiments, calculations, and group activities will be infused throughout the curriculum enabling students to research for themselves how truly difficult scientific problems were solved by ancient cultures and how modern scientific methods may be applied to such problems.

One of the crucial themes of the cluster is the decolonization of science: making clear that the history of science has been told through the lens of 500+ years of oppression by Western cultures, and that this modern history is but a small, recent chapter in the eons long story of humans’ worldwide struggle to understand nature and solve problems through experimentation. Expertise in this analysis comes from the Ethnic Studies Department, and we propose that ES 1810 open the sequence to lay the foundation of this understanding.

In ES 1810, this will happen through the examination of American Indian ways of knowing. The content of this course will add to student understanding of the many significant aspects of cultural phenomena including the juxtaposition of traditional versus modern forms of cultural practice and the role of context in determining, shaping and modifying imported or adopted cultural phenomena showing that numerous cultures worldwide prior to the modern era were engaged in sophisticated astronomical measurements, agriculture, resource management, and architecture.

In PHYS 1810, students will learn that numerous diverse cultures worldwide prior to the modern era had carried out extensive and sophisticated astronomical measurements. Course work will involve hands-on projects, student presentations, calculations, and data analysis. For example, there will be an open-ended, student-centered project at the beginning of the course where teams of students will build mechanical clocks of their own design (no electronic components allowed!) and will compete to see which methods perform the best over different time periods. Students will construct ancient astronomical measurement equipment (for example, astrolabes which are used for measuring the positions of stars and planets) and as part of their homework will carry out weekly measurements of sun, moon, star, and planet positions. Students can then analyze their data and make predictions. Such projects and discussions stemming from the projects will naturally engage the students in developing scientific and mathematical skills.

In ENGR 1810, students will learn about the principles associated to the engineering and construction technologies developed by each culture. The impact that technological developments had on each culture’s environment and their quality of life will be analyzed. As in the Physics course, hands-on projects will reinforce the concepts discussed in class – students will have the opportunity to try out various ancient engineering and construction techniques and through this practice learn about core engineering principles that still hold true today.
4. Explain how each course in the proposed learning community will support student learning of each of the cluster’s lower division general education area learning outcomes.

[See also the attached GE applications.]

**ES 1810**

Students completing this course will: (1) Gain an appreciation of the sophistication and complexity of American Indian astronomy, agriculture, resource management, and architecture (2) Be able to demonstrate an understanding of and be able to compare and contrast American Indian ways of knowing with modern views of science; (3) Apply ancient techniques of observing natural phenomena and data analysis methods in order to make predictions and calculations.

**PHYS 1810**

Students completing this course will: (1) Learn an appreciation of the sophisticated and complex astronomical measurements carried out by diverse ancient cultures and how these relate to modern scientific methods; (2) Be able to demonstrate an understanding of modern astronomy and cosmology and compare and contrast modern views with ancient ideas; (3) Apply mathematical techniques such as order-of-magnitude estimation and data analysis methods to make (astronomical) predictions and calculations.

**ENGR 1810**

Students completing this course will: (1) Learn about engineering and technology innovations created by pre-Columbian cultures and how these relate to modern engineering methods; (2) Apply values embraced by ancient cultures, such as care of the earth (Pacha Mama), to modern sustainable engineering practices; (3) Apply engineering techniques and data analysis methods to explain the origin ancient engineering structures.

**Course Outlines and Integrating Themes**

Across all three courses students will be carrying out hands-on projects, solving problems, making presentations, writing, building, experimenting, and measuring. There is significant overlap from different perspectives: for example, ancient astronomy will be touched on in Ethnic Studies 1810 from its cultural and societal importance, the techniques and methods of ancient (and modern) astronomical measurements will be explored in Physics 1810, and construction based on astronomical alignments will be studied in Engineering 1810. We are considering carrying out some measurements or design-construction projects across all three courses (for example, measuring the position of some astronomical objects, e.g., planets, sun, moon, over the course of the entire academic year). We are also considering coordinating some readings across courses, since there is overlap between subjects in all three courses in the areas of astronomy and celestial architecture.
## ETHNIC STUDIES 1810

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is science? Ethnoscience.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>2</td>
<td>Folk classification; native ways of knowing.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>3</td>
<td>Who’s Bering Strait Theory?</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>4</td>
<td>Resilience theory and climate change models.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>5</td>
<td>Native ecology.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>6</td>
<td>Eating on the wild side.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>7</td>
<td>Healing and medicine.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>8</td>
<td>Time, space, and astronomy.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>9</td>
<td>Mathematics.</td>
<td>Weekly blog, in-class discussions/projects.</td>
</tr>
<tr>
<td>10</td>
<td>Geology and geo-mythology.</td>
<td>Final project due.</td>
</tr>
</tbody>
</table>

## PHYSICS 1810

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Survey of the sky (sun, moon, planets)</td>
<td>Build astrolabe and other tools to begin measurement of the positions of major astronomical objects, calculations and problems based on how to measure.</td>
</tr>
<tr>
<td>2</td>
<td>Survey of the sky continued (stars and galaxies)</td>
<td>Calculations and estimates of solar system, galactic distances.</td>
</tr>
<tr>
<td>3</td>
<td>World constellations</td>
<td>Research particular culture’s constellations, find constellations and present to class.</td>
</tr>
<tr>
<td>4</td>
<td>Creation stories: ancient and modern</td>
<td>Research ancient creation stories from a particular culture, compare and contrast to modern understanding. Present to class.</td>
</tr>
<tr>
<td>5</td>
<td>Time-keeping: clocks</td>
<td>Build mechanical clock: time-keeping contest!</td>
</tr>
<tr>
<td>6</td>
<td>Time-keeping: calendars</td>
<td>Calculations related to astronomical events determining calendar.</td>
</tr>
<tr>
<td>7</td>
<td>Celestial architecture</td>
<td>Calculate, measure, and construct a miniature celestial architecture project.</td>
</tr>
<tr>
<td>8</td>
<td>Ancient and modern cosmology</td>
<td>Design experimental/observational tests of ancient cosmologies and carry out calculations.</td>
</tr>
<tr>
<td>9</td>
<td>Ancient and modern cosmology continued</td>
<td>Calculations and estimates of the size, age, expansion rate of the universe.</td>
</tr>
<tr>
<td>10</td>
<td>Review</td>
<td>Class presentations/reports on quarter-long astronomical measurements.</td>
</tr>
</tbody>
</table>
### ENGINEERING 1810

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overview of Different pre-Columbian cultures</td>
<td>Analyze and discuss the relevant pre Columbian cultures in central and south America.</td>
</tr>
<tr>
<td>2</td>
<td>Manufacturing Techniques</td>
<td>Manufacture different ancient artifacts in the lab. Understand the manufacturing processes involved</td>
</tr>
<tr>
<td>3</td>
<td>Metallurgy</td>
<td>Study the different metals and mining techniques.</td>
</tr>
<tr>
<td>4</td>
<td>Ancient Construction Materials</td>
<td>Study different materials used by ancient cultures. Create some of such materials (i.e. adobe) in the lab.</td>
</tr>
<tr>
<td>5</td>
<td>Ancient Construction Techniques</td>
<td>Different groups will build scale models of typical housing units belonging to different ancient cultures.</td>
</tr>
<tr>
<td>6</td>
<td>Water Management</td>
<td>Analyze water collection and distribution methods.</td>
</tr>
<tr>
<td>7</td>
<td>Transportation and Logistics</td>
<td>Analyze and recreate the communication and logistics methods used by different pre Columbian cultures.</td>
</tr>
<tr>
<td>8</td>
<td>Surveying</td>
<td>Use current surveying equipment and compare to surveying methods used by ancient culture.</td>
</tr>
<tr>
<td>9</td>
<td>Sustainability</td>
<td>Identify sustainable practices and recreate them in the lab.</td>
</tr>
<tr>
<td>10</td>
<td>Final course project</td>
<td>Student groups will present their final project</td>
</tr>
</tbody>
</table>
Application for General Education Credit  
for Lower Division Physical Science (Area B1)

Course title __ Astronomy of Ancient Cultures ____________  Course number  PHYS 1810 ___

Courses approved for general education credit must provide students with explicit instruction in the 
approved student learning outcomes. Please be as specific as possible in your explanations, describing 
topics, readings, assignments, activities and assessments that illustrate how the course supports 
students’ acquisition of the learning outcomes. Remember, there may be no one on the review 
committees who has any knowledge of your discipline. Attach the course syllabus and any assignments 
and/or assessments needed to support your explanations.

[Please use this template to address ALL of the following learning outcomes.]

Purpose of Science GE: The goal of lower division general education in the natural sciences is to gain basic 
knowledge and learn key principles in the life and physical sciences as essential for an informed citizenry. In 
addition, students should recognize the experimental and empirical methodologies characteristic of science 
and understand the modern methods and tools used in scientific inquiry.

1. Students will demonstrate broad science content knowledge in the physical sciences such as the nature 
and structure of matter, Earth’s place in the Universe, or the conservation of energy and matter.

This course will include a detailed survey of astronomical objects (sun, moon, planets, stars, galaxies) and 
how ancient and modern cultures understood the various aspects of these astronomical objects. Modern 
cosmology and the observational and experimental evidence for our modern theory of cosmology 
(including the Big Bang and inflation) will be studied and compared and contrasted with ancient theories 
of cosmology. There will be a particular focus on time and its measurement and relation to celestial 
observations. Both clocks and calendars will be studied, and the periodic motion of astronomical objects 
will be studied quantitatively.

2. Students will demonstrate the application of quantitative skills (such as statistics, mathematics and the 
interpretation of numerical graphical data) to physical science problems.

Astronomical and time-keeping will be studied through order-of-magnitude estimates, calculations, 
measurements, and data analysis (including graphical representation of data, basic statistical analysis, and 
fitting data). Quite sophisticated measurements can be performed (and were performed) using pre-modern 
instruments. Calculations of distance and time scales of planets, stars, and galaxies will be carried out, 
along with calculations of the size, age, and expansion rate of the universe. Calculations will be used in 
student projects involving astronomical measurements, time measurements with mechanical clocks and 
calendars built by the students, and celestial architecture projects.
3. Students will demonstrate a general understanding of the nature of science, the methods applied in scientific investigations, and the value of those methods in developing a rigorous understanding of the physical world. Students should be able to identify the difference between science and other fields of knowledge. Students should be able to distinguish science from pseudoscience.

One of the key themes of the course will be comparing and contrasting methods of ancient science with modern scientific techniques, and thus a very clear understanding of the scientific method and its value will be developed. With numerous hands-on scientific projects (clock building, calendar development, celestial architecture construction, astronomical measurements and analysis), the course will have a very strong emphasis on understanding first-hand the nature of science. By the end of the course, students will understand thoroughly how and why we know what we do about astrophysics today and how and why ancient cultures around the world possessed impressive and extensive astronomical knowledge.
Application for General Education Credit
for Lower Division Physical Science (Area B1)

Course title ___Pre-Columbian Engineering and Construction Technology___
Course number ___ENGR 1810___

Courses approved for general education credit must provide students with explicit instruction in the approved student learning outcomes. Please be as specific as possible in your explanations, describing topics, readings, assignments, activities and assessments that illustrate how the course supports students’ acquisition of the learning outcomes. Remember, there may be no one on the review committees who has any knowledge of your discipline. Attach the course syllabus and any assignments and/or assessments needed to support your explanations.

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

Purpose of Science GE: The goal of lower division general education in the natural sciences is to gain basic knowledge and learn key principles in the life and physical sciences as essential for an informed citizenry. In addition, students should recognize the experimental and empirical methodologies characteristic of science and understand the modern methods and tools used in scientific inquiry.

1. Students will demonstrate broad science content knowledge in the physical sciences such as the nature and structure of matter, Earth’s place in the Universe, or the conservation of energy and matter.

   This course will focus on understanding the engineering and science principles through applications, processes, devices and building created by ancient cultures. For instance, material science principles will be explained through ancient culture manufacturing techniques. Physics and engineering principles will be shown by analyzing pre Columbian materials and construction techniques.

2. Students will demonstrate the application of quantitative skills (such as statistics, mathematics and the interpretation of numerical graphical data) to physical science problems.

   All topics included in class will have a quantitative component. Special emphasis will be given to the structural analysis of ancient buildings, life cycle analysis of ancient manufacturing and water management techniques. The module on surveying will use principles of geometry and trigonometry.

3. Students will demonstrate a general understanding of the nature of science, the methods applied in scientific investigations, and the value of those methods in developing a rigorous understanding of the physical world. Students should be able to identify the difference between science and other fields of knowledge. Students should be able to distinguish science from pseudoscience.

   Every topic in the course is tied to a different engineering discipline. Students attending the class will differentiate each engineering specialty, and understand the differences and similarities between engineering and science.
Application for General Education Credit
for Lower Division Social Science Course (Area D1-3)

Course title__American Indian Science______ Course number____ES1810__
Maximum enrollment_______50______

Courses approved for general education credit must provide students with explicit instruction in the approved student learning outcomes. **Please be as specific as possible in your explanations, describing topics, readings, assignments, activities and assessments that illustrate how the course supports students’ acquisition of the learning outcomes.** Remember, there may be no one on the review committees who has any knowledge of your discipline. Attach the course syllabus and any assignments and/or assessments needed to support your explanations.

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

Courses in this area acquaint students with fundamental principles and methods of inquiry, theoretical problems, and applications grounded in social science disciplines whose field of study is human behavior in its social environment.

1. Students will demonstrate, orally and in writing, recognition of the application of disciplinary concepts derived from at least three social or behavioral sciences in the study of human behavior, individually and in society.

   In this course the students will be introduced to the concept of resilience theory as it is applied to the intersection of the human and non-human natural worlds. Resilience in this context is the capacity of a social-ecological system to withstand perturbations from for instance climate or economic shocks and to rebuild and renew itself afterwards. This course will investigate American Indian sciences, theory and practice, from Blackfoot physics, Pueblo agro-ecological and environmental sciences, to Pomo and Miwok methods of food gathering, production, preservation, and preparation to Quechua astronomy and climatology. Students in this course will be introduced to the fields, of ethnoscience and cognitive science. Both fields focus on the study of how cultures construct and classify reality by identifying, labeling, and creating taxonomies for cultural criteria. After learning the evolution of the fields of study, students will be introduced to the ways in which different cultures organize and categorize domains of knowledge. Students will be asked to focus on knowledge domains from the biological and environmental realms, as they are relevant to specific cultures and will create folk taxonomies for plants, animals, landscapes, and kin.

2. Students will demonstrate, orally and in writing, recognition of the inquiry methods used by at least one of the social or behavioral science disciplines.

   Student will be asked to examine the differences and similarities between native sciences and western sciences and explore the philosophical tenants behind these different forms of knowledge production. Contemporary Native American relations with Western science (resource management, genetic engineering, biocolonialism, native resources exploitation, ecological restoration) will also be
explored through specific indigenous case studies using data from American Indian oral literature, ethnological research, ethnobotanical and ethnoecological research findings, and western natural resources case studies.

3. Students will demonstrate, orally and in writing, the ability to describe how human diversity and the diversity of human societies influence our understanding of human behavior, individually and in societies, both local and global

The students will be required to complete a Native Science project. Through the project students will be asked to define “science” from a philosophical and practical perspective. They will then examine a particular American Indian Tribe and/or issue including some aspect of the more-than-human natural world (i.e., a natural process, element, or species like water, climate, birds, salmon, soil, fire, plants, etc.). Students will then examine the interplay of Native science and Western science (i.e., are they working together or are they some times in conflict or some combination of the two). Finally, the students will demonstrate their understanding of both the Native and Western understanding using critical writing and graphical tables that reveal their methodologies and conclusions.

4. Students will demonstrate, orally and in writing, some knowledge of the political, social, and/or economic institutions of a country other than the United States.

Throughout the continuum of contact between Western-based scientific inquiry and that of Native sciences Western researchers have laid forth scores of theories attempting to explain the origins and diffusion of American Indians, extinction of North American mega fauna, and complex ecological understandings unique to the Americas. A course of Native Science encourages a closer look at these claims through the lens of American Indian worldview and models of the natural worlds.

5. Students will demonstrate, orally and in writing, the ability to describe major positions and contrasting arguments made on one or more significant contemporary issue area confronting US society as applied to human behavior. (Possible areas include: biomedical and health issues, class, crime, discrimination, education, energy, environment, gender, global economy, immigration, military intervention abroad, poverty, race, technology.)

Inherent in the study of Native Science is a multi-faceted approach to perceiving the natural world. Through the course students are constantly required to reconcile the differences and similarities among Western and the various Native approaches to explaining the natural world. Students will be asked to demonstrate their understandings
through weekly Discussion Fora, blogs, and a Final Project. One of the intents of the Ethnic Studies program is to guide the student towards becoming a better academic writer. In this case this means becoming familiar with and practicing the rhetorical strategies, critical thinking, and styles of the disciplines unique to American Indian Studies. For example, what is a post-modern stance with regards to voice? What claims to “knowledge” should be considered when a person of color authors an article? And how do we recognize “determinism?” Native Science students will not only learn to identify these strategies and styles, as they pertain to Native and Western science, but will also learn to incorporate them into their own work. In the process of the reading and writing, students will become familiar with how academics construct knowledge and data into a written form. The avenue along which student in this course will develop their critical thinking and writing skills will be the controversial themes, debates and topics related to different approaches to the notion of science. Students will be asked to demonstrate their understandings through weekly Discussion Fora, blogs, and a Final Project.
Physics 1810 – Astronomy of Ancient Cultures: Course Syllabus

Instructor
Professor Derek F. Jackson Kimball
Office: North Science Room N231.
Phone: (510) 885-4634
e-mail: derek.jacksonkimball@csueastbay.edu
Office hours/study sessions: MW 11:30am-12:30pm, F 3:00-5:00 pm (N236), or by appointment.

Web information
Course information, handouts, problem sets, solutions, etc. will be posted on BlackBoard.

Text

The *Power of Stars* fills a much needed niche in the literature, by providing a lively, richly illustrated survey of the human response to the sky across the centuries and across all cultures. The book covers all aspects of how civilizations studied and responded the sky. From the opening chapter, which gives a survey of visible phenomena from the sun, moon and planets, the book provides a multicultural perspective on the experience of the sky. The motions of the sun and moon across the sky and on the horizon were noticed by ancient people and the book describes their legends and skywatching practices. In Chapter 2, the book gives an overview of constellations from a wide variety of cultures, including the ancient Chinese, Egyptian, Hawaiian, Native American Chumash and Navajo tribes, the Inuit culture, and also covers the Southern skies, such as the Aboriginal Australians and the Incan cultures. In Chapter 3, Creation Stories from a wide variety of cultures are described, and in Chapter 4 their models of the universe or Cosmologies are described and illustrated. The wide variety of descriptions of the early universe, the the structure of the physical universe from ancient Greek, Egyptian, Chinese, Babylonian, Mayan and other cultures are explained and illustrated with original art. In Chapters 5 and 6 the evolution of timekeeping and calendars are described, including the dramatic stories of the Mayan 2012 cycle, the Harrison navigation clocks, and the development of modern atomic clocks and GPS systems. Chapter 7 describes “Celestial Architecture” where temples and buildings (Stonehenge, Newgrange, and also cathedrals) are aligned with the sun and stars. The remaining chapters turn a lens onto our own culture, and describe how our modern cities contain within them cosmological symbolism and alignments, and how ancient traditions and modern technology coexist in the 21st century. The last chapter also gives a history of the development of the Modern Big Bang cosmology, and some of the remaining “unanswered questions” to be studied and explored by future astronomers. The book provides a unique wide angle lens to the many ways that society understands and describes the stars, and in the process explores how that process reveals universal qualities of humankind.

Student Learning Objectives (SLOs)
Students completing this course will be able to:

(1) Learn an appreciation of the sophisticated and complex astronomical measurements carried out by diverse ancient cultures and how these relate to modern scientific methods;

(2) Be able to demonstrate an understanding of modern astronomy and cosmology and compare and contrast modern views with ancient ideas;

(3) Apply mathematical techniques such as order-of-magnitude estimation and data analysis methods to make (astronomical) predictions and calculations.
Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Projects</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Survey of the sky (sun, moon, planets)</td>
<td>Build astrolabe</td>
<td>Sky measurements</td>
</tr>
<tr>
<td>2</td>
<td>Survey of the sky (stars &amp; galaxies)</td>
<td>Complete astrolabe</td>
<td>Solar system &amp; galactic distances</td>
</tr>
<tr>
<td>3</td>
<td>World constellations</td>
<td></td>
<td>Class presentation</td>
</tr>
<tr>
<td>4</td>
<td>Creation stories: ancient and modern</td>
<td>Build clock</td>
<td>Class presentation</td>
</tr>
<tr>
<td>5</td>
<td>Time-keeping: clocks</td>
<td>Complete clock</td>
<td>Time-keeping contest!</td>
</tr>
<tr>
<td>6</td>
<td>Time-keeping: calendars</td>
<td></td>
<td>Calendar calculations</td>
</tr>
<tr>
<td>7</td>
<td>Celestial architecture</td>
<td>Design mini-architecture</td>
<td>Stellar alignment</td>
</tr>
<tr>
<td>8</td>
<td>Ancient and modern cosmology</td>
<td>Build mini-architecture</td>
<td>Tests of cosmology</td>
</tr>
<tr>
<td>9</td>
<td>Ancient and modern cosmology</td>
<td></td>
<td>Size and age of universe</td>
</tr>
<tr>
<td>10</td>
<td>Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Final Exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grading

Homework & calculations: 20%
Class presentations: 20%
Class projects: 30%
Final: 30%

The grading will be curved, in a sense. There will be no set number of A’s or B’s or C’s, so the grading is not “competitive” per se, but the overall scale will be adjusted to take into account overall class performance (based on the mean and standard deviation of the scores on the exams and problem sets compared to previous years). Improvement will be taken into account when considering “borderline” cases. A general sense of where you are at will be provided near the middle of the course.

You can check your current grades in all areas using BlackBoard.

Disabilities

If you have a documented disability and wish to discuss your Student Disability Resource Center (SRDC) approved academic accommodations, or if you would need assistance in the event of an emergency, please make an appointment to meet with me as soon as possible.

Supportive and inclusive environment

In all our classes we strive to create an safe, supportive classroom environment where everyone is listened to and respected. We are learning physics together as a team: be kind and respectful to me and your fellow students.

Academic dishonesty

We follow the CSUEB Academic Dishonesty policy: http://www20.csueastbay.edu/academic/academic-policies/academic-dishonesty.html. Deception for individual gain is an offense against the members of the university community. First offense will result in a zero for the assignment/exam and filing of an academic dishonesty report to the University administration. Second offense will result in failure of the course and another report to the University administration.
Engineering 1810 –
Pre-Columbian Engineering and Construction Technology: Course Syllabus

Instructor
Professor Cristian Gaedicke
Office: VBT 362
Phone: (510) 885-2208
e-mail: cristian.gaedicke@csueastbay.edu
Office hours/study sessions: TTh 1:30-3:00P and by appointment, or by appointment.

Web information
Course information, handouts, problem sets, solutions, etc. will be posted on BlackBoard.

Overview
We will learn about the principles associated to the engineering and construction technologies developed by various pre-Columbian cultures. The impact that technological developments had on each culture’s environment and their quality of life will be analyzed. Hands-on projects will reinforce the concepts discussed in class - students will have the opportunity to try out various ancient engineering and construction techniques and through this practice learn about core engineering principles that still hold true today.

Student Learning Objectives (SLOs)
Students completing this course will:

(1) Learn about engineering and technology innovations created by pre-Columbian cultures and how these relate to modern engineering methods;
(2) Apply values embraced by ancient cultures, such as care of the earth (Pacha Mama), to modern sustainable engineering practices;
(3) Apply engineering techniques and data analysis methods to explain the origin ancient engineering structures.

Grading

Homework & calculations: 20%
Class presentations: 20%
Class projects: 30%
Final: 30%

The grading will be curved, in a sense. There will be no set number of A’s or B’s or C’s, so the grading is not “competitive” per se, but the overall scale will be adjusted to take into account overall class performance (based on the mean and standard deviation of the scores on the exams and problem sets compared to previous years). Improvement will be taken into account when considering “borderline” cases. A general sense of where you are at will be provided near the middle of the course.

You can check your current grades in all areas using BlackBoard.
Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Projects</th>
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<tbody>
<tr>
<td>1</td>
<td>Overview of Different pre-Columbian cultures</td>
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<tr>
<td>2</td>
<td>Manufacturing Techniques</td>
<td>Manufacture ancient artifacts</td>
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<td>3</td>
<td>Metallurgy</td>
<td>Metal and mining techniques</td>
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<td>4</td>
<td>Ancient Construction Materials</td>
<td>Make adobe</td>
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<tr>
<td>5</td>
<td>Ancient Construction Techniques</td>
<td>Build scale models of typical housing</td>
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<td>6</td>
<td>Water Management</td>
<td>Analyze water collection and distribution methods.</td>
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<td>7</td>
<td>Transportation &amp; logistics</td>
<td>Recreate communication and logistics methods</td>
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<tr>
<td>8</td>
<td>Surveying</td>
<td>Use modern/ancient surveying equipment</td>
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<td>9</td>
<td>Sustainability</td>
<td>Lab on sustainable practices</td>
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<tr>
<td>10</td>
<td>Final project presentations</td>
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<tr>
<td>11</td>
<td>Final Exam</td>
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Disabilities

If you have a documented disability and wish to discuss your Student Disability Resource Center (SRDC) approved academic accommodations, or if you would need assistance in the event of an emergency, please make an appointment to meet with me as soon as possible.

Supportive and inclusive environment

In all our classes we strive to create a safe, supportive classroom environment where everyone is listened to and respected. We are learning physics together as a team: be kind and respectful to me and your fellow students.

Academic dishonesty

We follow the CSUEB Academic Dishonesty policy: [http://www20.csueastbay.edu/academic/academic-policies/academic-dishonesty.html](http://www20.csueastbay.edu/academic/academic-policies/academic-dishonesty.html). Deception for individual gain is an offense against the members of the university community. First offense will result in a zero for the assignment/exam and filing of an academic dishonesty report to the University administration. Second offense will result in failure of the course and another report to the University administration.
FATHER SKY/MOTHER EARTH” AMERICAN INDIAN SCIENCE
ES 1810 • Fall 2014
Mon/Weds. 12:00 – 1:10
Hybrid

Enrique Salmon, Ph.D.
American Indian Studies, Cal State University East Bay
Office Meiklejohn 4103; enrique.salmon@csueastbay.edu
Office Hours: Monday & Wednesday 9:00 -10:30 & 1:15 – 2:30

Course Overview:
This course will investigate American Indian sciences, theory and practice, from Blackfoot physics to Pueblo agricultural and environmental sciences, from Pomo and Miwok methods of food gathering, production, preservation, and preparation to Quechua astronomy and climatology. We will examine the differences and similarities between native sciences and western sciences and explore the philosophical tenants behind these different forms of knowledge production. Contemporary Native American relations with western science (resource management, genetic engineering, biocolonialism, native resources exploitation, ecological restoration) will also be explored through specific indigenous case studies.

Students in this course will be introduced to the fields of American Indian science and Ethnoscience, the study of how cultures construct and classify reality by identifying and labeling cultural criteria. After learning the evolution of the fields of study, students will be introduced to the ways in which different cultures organize and categorize domains of knowledge. The class will focus on knowledge domains from the biological and environmental realms, as they are relevant to specific cultures. These will include plants, animals, landscapes, and kin.

Instructional Methods:
Lectures, Readings, Class Participation, Cooperative Learning, Films, Science Project

Course Objectives:
1. Students will gain an understanding of the history of Ethnoscientific research
2. Students will be able to identify the various ways that cultures rely on domains for building mental spaces
3. Students will gain insight into the intricacies of Cognitive and Linguistic Anthropology

Required Text:
Blackfoot Physics: A Journey into the Native American Worldview, F. David Peat
(Phanes Press, 1996)
Native Science – Natural Laws of Interdependence by Greg Cajete
(Clear Light Publishers 2000)
Red Earth, White Lies: Native Americans and the Myth of Scientific Fact, by Vine Deloria;
Fulcrum Publishing (1997)

Recommended Reading:
Science and Native American Communities – Legacies of Pain, Visions of Promise,
Keith James (University of Nebraska Press, 2001)

This Syllabus is a Contract. You are responsible for reading this syllabus thoroughly. Your final grade is based on meeting the terms of the expectations that are identified below.
Final Grading:
Class Attendance/Participation 10% • Discussion Forum 30%• Weekly Blogs 30%
Final Project 30%

Class Expectations & Grading Policies:
Attendance is mandatory. You are responsible for all class material. Multiple absences may result in the student receiving a lower grade or an Incomplete, a much lower grade, or withdrawing from the class. Only absences accompanied by an official doctor's note will be excused. Missing more than 10% of the class meetings throughout the semester will result in a 10% lower letter grade for the class. Do not arrive late to class. Students are expected to participate in class Discussions and online Discussion For a and Blogs through critical questioning of the instructor’s information and the required text, offering data from self-motivated research and reading, and through intra-student debate and critical analysis. Students are expected to arrive to class on time. Tardiness and early exits will be noted and multiple tardies/early exits will result in the student receiving a lower grade in the class.

Active participation is essential for this class. Therefore, it is expected that all students will:
• Complete readings for each class meeting thus allowing full class collaboration
• Actively and vocally participate in class discussions with questions and comments
• Maintain an atmosphere of active listening, mutual respect, and supportive collegiality
• Be prepared for in class exercises and assignments
• Complete all assignments and hand them in on their assigned due dates

Final Project: you will need to complete a final native science project that is valued at 30% of your final grade. The project must: a) define “science” from a philosophical and practical perspective; b) examine a particular American Indian Tribe and/or issue; c) include some aspect of the more-than-human natural world (i.e., a natural process, element, or species like water, climate, birds, salmon, soil, fire, plants, etc.); and d) examine the interplay of native science and western science (i.e., are they working together or are they some times in conflict or some combination of the two). The Final Project will be due June 4th

Course Requirements:
1. Class Participation. Each student is expected to read assigned materials and to participate in class discussion, and class exercises. This is worth 10% of your final grade.
2. Discussion Forum. Each student is expected to read assigned materials and to post twice weekly onto the Discussion Forum on Blackboard. Forum topics will be presented in class and in the Discussion Forum section. Students are expected to participate on these online conversations. While participating in the Online Forum students are advised to write in an academic manner. This means that students should use proper grammar when posting their responses. This is worth 30% of your final grade.
3. Weekly Blog. Each student will write a Weekly Blog. Each weekly Student Blog section will be found in Blackboard under Course Materials. The Blog will consist of a 500-1000 word critical analysis reacting to the theme, discussions, or reading for each week. Each Blog should address (1) your personal response to the weekly reading(s) and a brief discussion of the issues and subjects that are being addressed. In addition,
each student is expected to read blogs written by other students and to post helpful and critical comments to the other student blogs. This is worth 30% of your final grade.

**Grading**

1. Late assignments will be penalized 10%. Each succeeding day of tardiness will deduct an additional 10%

**Class Schedule:**

**Week**

**Week 1**
Introductions; What is Science?; Ethnoscience, History of Ethnoscientific Thinking  
**Read:** Cajete Ch. 2; Deloria Chs. 1 & 2; Peat Ch. 10

**Week 2**
Folk Classification; Taxonomies; Categories; Native Ways of Knowing  
**Read:** Cajete Ch. 3; Peat Chs. 2 & 3

**Week 3**
Who’s Bering Strait Theory?  
**Read:** Deloria Chs. 3 & 4; Peat Ch. 4

**Week 4**
It’s Like a Garden; Caring for the land, Resilience Theory; Resilience and Climate Change Models  
**Read:** Deloria Chs. 5 & 6;

**Week 5**
A Native Ecology; Semantic Domains and Encoded Knowledge of Nature;  
**Read:** Cajete Ch. 6

**Week 6**
Eating on the Wild Side  
**Read:** Cajete Ch. 4;

**Week 7**
Healing and Medicine  
**Read:** Cajete 4, Peat Chs. 5 & 6

**Week 8**
Time, Space; and Astronomy  
**Read:** Cajete Ch. 7; Peat Ch. 8

**Week 9**
Adding it all up; Mathematics  
**Read:** Peat, Ch. 7

**Week 10**
Geology & A Native Geo-mythology  
**Read:** Deloria Chs. 8 & 9

************* Final Project Due Online by June 4th *************
Approved by Department Chairs:

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Approved by College Dean/Associate Dean from each participating college

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Signatures of three faculty members: Ideally, the person who will teach the courses will participate in the cluster planning. However, recognizing the staffing difficulties departments face, the faculty member who plans the cluster must agree to provide a thorough orientation to the expectations and methods developed for the learning community to the actual instructor. If monies are available, faculty should be available for meetings in the late spring to plan integration points in the yearlong curriculum.

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Proposals should be submitted as soon as possible and no later than Friday, April 4, 2014. Please submit proposals to sally.murphy@csueastbay.edu and linda.beebe@csueastbay.edu.

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9 While Colleges do not approve courses for GE, College approval assures support for departmental participation.