Allan Hancock College

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Geology and Physical Science
2013-2019 Program Review

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Section 1: Program Review (Self-study Team)

I. Program Mission *(must align with college mission statement)*: Describe the need that is met by the program or the purpose of the program and explain how it aligns with the college mission and strategic plan.

The purpose of the AHC Geology and Physical Science program is to offer a variety of courses in geology and physical science that are rigorous, current, and meet the educational needs of: students majoring in these and related disciplines, general education students, and interested community members so that all of these students can be successful at AHC and beyond. The program supports the College's mission by promoting the development of scientific literacy, critical thinking, communication skills, and a sense of service to community in our students.

II. Progress Made Towards Past Program/Department Goals: Summarize the progress the discipline has made toward achieving its goals during the past six years. Discuss briefly the quality, effectiveness, strengths and struggles of the program and the impact on student success as reflected in past comprehensive program reviews and annual updates.

The limited progress made towards meeting program goals set out in the 2007-2008 program review, as well as the lack of a comprehensive program review since 2007-2008, may indicate a loss of focus due to the illness of the lead faculty member. The information on progress towards the 2007-2008 goals reported below is taken from the 2012 annual update as well as new work done as part of the current program review process. In particular, the development of a Historical Geology course and an AS-T degree in Geology hold promise for strengthening the program going forward.

Previous Goal	Status
Recommendations to improve desired student outcomes and student performance.	
1. Hire a full-time faculty to cover FTEF deficiencies in Physical Science and Geology. This faculty member would teach Physical Science and Astronomy courses, allowing the current Geology/Physical Science faculty (one person) to concentrate on improving the Geology Program including, for example, offering Historical Geology and/or adding a lab component to GEOL 141 - Environmental Geology. 2. Assess Student Learning Outcomes for each course in the program.	1. A second full-time faculty member has not yet been hired for Geology/Physical Science and, in fact, the program has suffered the loss of its only full-time faculty member. This loss, combined with the ongoing demand for additional staffing in the program, make hiring a new full-time faculty member in Geology/Physical Science an urgent need. 2. This goal was met, as SLOs were assessed for all six Geology courses and both Physical Science courses offered during the 2011-2012 academic year.
Recommendations to accommodate changes in student characteristics.	
Enrollment changes: 1. Increase outreach to local elementary and high schools to advertise the Geology/Physical Science courses offered at AHC.	1. No progress had been made on outreach to local elementary and high schools as of 2012 but renewing this effort could be a great opportunity for a new full-time faculty member.
Demographic changes:	1. No progress had been made on efforts to increase MESA involvement and engage more

1. Increase involvement in the MESA program to address deficiencies in the number of underrepresented groups in the Earth Sciences.	underrepresented students in the Earth Sciences as of 2012 because of "the MESA program's lack of willingness to help students become interested in Earth Sciences". A renewed effort to address this goal could also be an important task for a new full-time faculty member.
Recommendations to improve the educational environment.	
Curricular changes: 1. Develop and offer a Historical Geology course with a lab component. Regular offerings of this course would enable AHC to offer an AS degree in Geology. This may lead to an overall increase in enrollment in Geology courses by local high school graduates. 2. Develop and offer a course in Meteorology. This depends on the success of the recently approved course in the Humanities Department. Life and Physical Sciences could not develop its own Meteorology course while the other course exists because of content overlap restrictions. 3. Develop a distance learning Oceanography course. 4. Develop and offer "Semester Abroad" courses. Destinations could include: New Zealand, Canada, Baja California, Europe, and/or South America. 5. Develop and offer an Honors Geology course (GEOL 188) to supplement the current Physical Geology course (GEOL 100). 6. Reassess the core curriculum for the Environmental Studies AA degree. 7. Develop and offer a (short) course in Geophysics that specifically targets MESA students enrolled in Physics courses. This course would have a field methods component requiring specific equipment, such as: a magnetometer, gravimeter, GPS survey equipment, and/or reflection seismology equipment. Funding for this equipment could be in the form of grants or donations by local geotechnical firms.	1. An outline for a Historical Geology course, as well as proposals for an AS-T degree in Geology and a Guided Pathways schedule for geology, have been completed in conjunction with this program review and will be submitted for further consideration during the fall 2020 semester. 2. No such course has been developed by Life and Physical Sciences because it would duplicate an existing Meteorology course offered by Physical Geography . 3. No progress had been made on adapting Oceanography for distance learning as of 2012, but this would be an important task for a new full-time faculty member as no other Geology or Physical Science courses are currently offered via distance learning. 4. No progress had been made on developing a Semester Abroad course as of 2012, but this could be an opportunity for a new full-time faculty member. 5. No progress had been made on developing an Honors Geology course as of 2012, but this could be an important task for a new full-time faculty member. 6. This degree program was discontinued in 2010. 7. No progress had been made on developing a course in geophysics for MESA students enrolled in Physics as of 2012, but funding obtained from a STEM Grant may make it possible for the Life and Physical Sciences department to purchase the necessary equipment. Renewing work on this goal would be an appropriate task for a new full-time faculty member.
Co-curricular changes: 1. Increase recruitment of student tutors for the Geology/Physical Science courses. Two to three tutors per semester would be ideal. 2. Consider starting a Geology Club.	1. This goal had been accomplished by 2012 when three tutors were available through the Tutorial Center. 2. No progress had been made on the proposal to start a Geology Club as of 2012 and the goal was dropped due to a lack of interest at that time.

Related community plans: 1. Solicit donations from local industry (oil companies, consulting firms, etc.) to assist the Geology/Physical Science program, especially with field course expenses. 2. Solicit opinions from local employers (oil companies, U.S. Geological Survey, consulting firms, etc.) about the skills needed for jobs in Earth Sciences. This information would then be incorporated into the Geology/Physical Science curriculum. 3. Develop a plan to offer student internships with local environmental consulting firms and related businesses.	1. No progress had been made on the proposal to solicit donations from local industry to assist the Geology/Physical Science program as of 2012, but this would be an appropriate task for a new full-time faculty member. 2. Progress was made on this proposal because discussions about desired job skills were held with the staff of the U.S. Geological Survey's Santa Maria office by 2012. Conducting additional discussions with potential employers and modifying the Geology/Physical Science curriculum appropriately would be an important task for a new full-time faculty member. 3. Progress was made on the proposal to develop student internships with local geology employers by virtue of the discussions held with the U.S Geological Survey staff (item 2 above), but moving forward on this goal would be a task for a new full-time faculty member.
Recommendations that require additional resources.	
Facilities: 1. Develop a rock garden that highlights the geology of the local area.	1. Project completed by 2012.
Equipment: 1. Seek funds for and purchase camping equipment that can be loaned to needy students to use during the field studies courses. 2. Repair existing CB radios and antennae or replace if necessary.	1. No progress had been made on raising funds to purchase camping equipment by 2012, but some equipment (e.g., sleeping pads, camp chairs) were acquired by donation. 2. As of summer 2020, the department IT technician confirmed that the radios and antennae are in working order.
Staffing: 1. Hire a full-time faculty member to cover FTEF deficiencies in Physical Science and Geology. This faculty member would teach Physical Science and Astronomy courses, allowing the current Geology/Physical Science faculty (one person) to concentrate on expanding the Geology Program offerings.	1. No progress on this goal as of 2012 but see response to item (1) under "Recommendations to improve desired student outcomes and student performance" above.

III. Analysis of Resource Use and Program Implementation: Describe the program's current allocation and use of human, physical, technology, and fiscal resources. Are resources sufficient and appropriate to meet program needs? Can program resources be reallocated to better meet student needs? If so, how?

Human Resources: The recent loss of the geology program's single full-time faculty member, who served as chief "recruiter" for the discipline, may have adversely impacted enrollments although FTES for both

Geology and Physical Science have trended gradually upward since 2014-2015. Both disciplines have experienced modest declines in FTES/FTEF from 2013-2014 through 2018-2019 although they have "leveled out" in recent years (Fig. 1). In 2017-2018 FTES/FTEF in both programs were close to the campus-wide average of 13 FTES/FTEF for all credit courses.

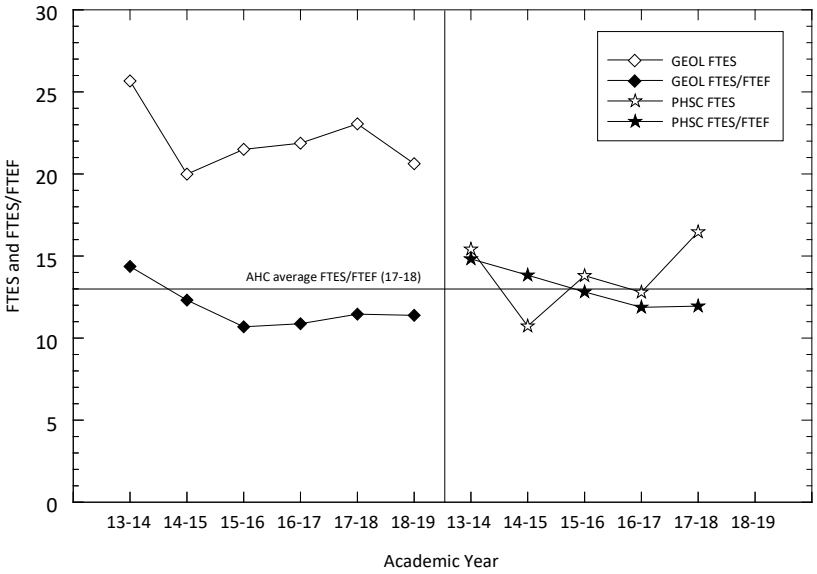


Figure 1: FTES and FTES/FTEF for Geology (left) and Physical Science (right) for academic years 13-14 through 17-18.

Physical Resources: Faculty working in the program indicate that lab facilities and materials are sufficient for teaching the existing geology courses, but are concerned that the current scheduling of other courses in the geology lab may make it difficult to have that room available for new courses for the discipline (e.g. Historical Geology). Adding Historical Geology would also require purchase of additional lab materials, such as fossil samples, maps, etc.

Technological Resources: Discussions with current faculty suggest existing technological resources are adequate for the courses presently offered. To give students experiences with technologies that are routinely used in advanced academic and industrial applications, however, faculty suggest that the acquisition of a site license for ArcGIS and new laptops to run it are warranted.

Fiscal Resources: As indicated in Section 1.II, hiring a new full-time faculty member in geology is crucial to growing the program. In addition, the purchase of camping equipment to lend to students for use during geology field trips and bus or two vans to transport 32 students on these trips are ongoing fiscal needs—see section 6 below.

IV. Program SLOs/Assessment: What are your program student learning outcomes? Have each of these been assessed since the last comprehensive program review? Describe changes you have made to courses or the program based on these data.

Program Student Learning Outcomes for Geology and Physical Science are:

1. GEOL PSLO 1: Apply the scientific method to solve geological problems.
2. GEOL PSLO 2: Identify a variety of geological specimens (e.g., rocks, minerals, fossils).
3. GEOL PSLO 3: Interpret geologic data (rocks, maps, cross sections, etc.) in terms of plate tectonic theory.
4. GEOL PSLO 4: Identify the impacts of geological processes on society and vice versa.
5. GEOL PSLO 5: Communicate effectively, in written and oral formats, the skills listed above.

1. PHSC PSLO 1 - Carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.
2. PHSC PSLO 2 - Describe the methods and standards of science and the fundamental principles that govern the universe.
3. PHSC PSLO 3 - Give examples of processes which illustrate the application of a major scientific principle.
4. PHSC PSLO 4 - Identify a variety of geological specimens (e.g., rocks, minerals, fossils) and interpret geologic data (rocks, maps, cross sections, etc.), both in terms of plate tectonic theory.
5. PHSC PSLO 5 - State the major scientific principles in both verbal and in simplified mathematical form.

PSLO Assessments: Three Geology PSLOs were assessed for GEOL 100 in fall 2016 and all the Physical Science PSLOs (including those for two Geology field courses) were assessed between fall 2013 and spring 2019 (Fig. 2). The program's full-time geology instructor noted that *in both disciplines students typically met or exceeded standards at higher rates for those outcomes that were supported by lab activities*.

For Physical Science, the data suggest that students of both genders meet or exceed the standards for most of the PSLOs with the exceptions of females on PSLOs 3 and 5 and males on PSLO 2 (section 2, Table 1). The PSLOs on which female students fail to meet or exceed standards require stating or illustrating scientific principles whereas the PSLO on which male students fail to meet or exceed the standard requires demonstrating an understanding of the methods or standards of science. Non-Hispanic White (Caucasian) students meet or exceed the standards for all of the PSLOs whereas other underrepresented students meet or come close to meeting the standards for all of the PSLOs for which data are available. Hispanic students, however, meet or exceed the standards only for Physical Science PSLO 1 and meet the other PSLOs at rates 10-20% lower than that of their classmates.

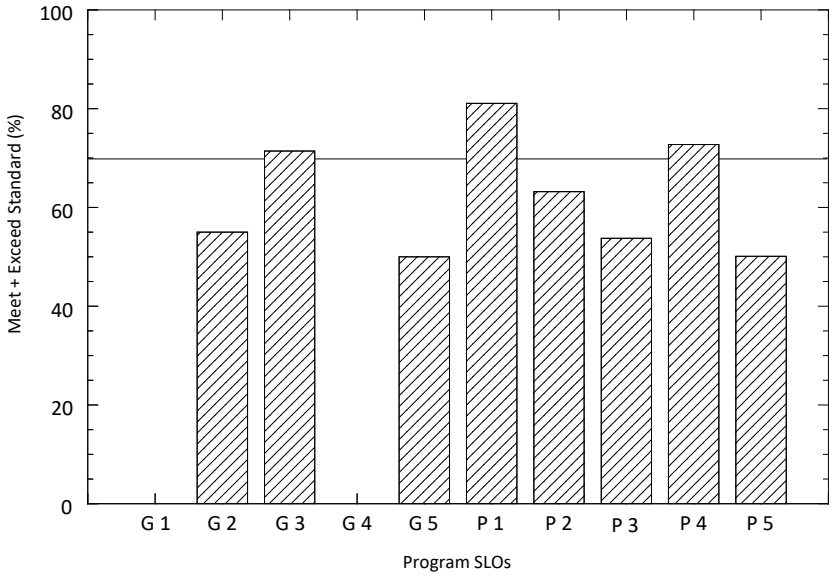


Figure 2: Percentages of students who met and exceeded standards for PSLOs 2, 3 and 5 in Geology and 1-5 in Physical Science.

Although PSLO data are limited for Geology, CSLOs were assessed for: three non-field Geology courses, one field Geology course, and one Physical Science course between spring 2011 and spring 2012 (section 2, Table 2). In Geology, these assessments led the instructor to add (1) homework assignments and periodic quizzes to encourage students to read the textbook more carefully and (2) more topographic map exercises to the labs. In Physical Science the instructor added more homework to the lecture and more analytical exercises to the labs. He also planned to add telescopic observing sessions and field trips to

study local geologic features to the PHSC 112 labs, although no data were reported to indicate how effective any of these changes were.

V. Distance Learning: Describe the distance education courses offered in your program and any particular successes or challenges with these courses. Include the enrollment as well as percentage of courses offered by modality and the rationale for this ratio. As well, describe how program instructors ensure regular substantive instructor-initiated contact in online classes.

The Geology/Physical Science program does not currently offer any courses that are approved for distance education, although conversion of Oceanography (GEOL 114) to this format has been proposed. Revising this class to meet distance learning requirements would give the discipline a class that could be offered online, a valuable option under current circumstances.

VI. Success, Retention, and Equity: Describe how the program works to promote student success. Include teaching innovations, use of academic and student support services (library, counseling, LAP, community partnerships, etc.). Refer to list of Student Services. Then, utilizing data from the office of Institutional Research and Planning, report on student success through course completion and retention data. Analyze, by discipline, success by gender, age, ethnicity, and online (may analyze other variables such as disability, English as a second language, day vs. night courses, etc. as appropriate). Suggest possible reasons for these trends and planned actions to address any disproportionate impact.

Promoting student success: In his 2012 annual update the full-time geology/physical science instructor highlighted success in recruiting tutors who helped students taking Geology and Physical Science courses succeed. He also expressed interest in having Earth Science students participate in the MESA program. Although that did not work out prior to when the 2012 annual update was written, MESA is a student support service that could potentially be of benefit to future Earth Science students. Other proposed innovations (such as developing: additional courses, a study abroad or geology honors program, student internships, etc.) were 'put on hold' by the loss of the full-time geology/physical science instructor but progress towards them may be able to resume when a new instructor is hired.

Overall retention and success: For 2013-2014 through 2018-2019 both retention and success rates for Geology are lower than the rates for Physical Science (Fig. 3). Success and retention for Geology are also typically slightly below AHC 6-year averages, whereas those for Physical Science are typically at or above those averages.

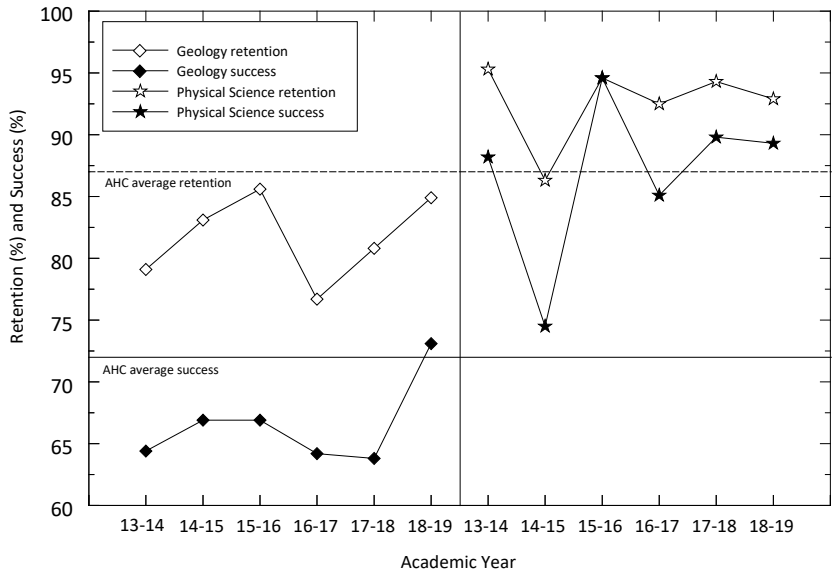


Figure 3: Student retention (open symbols) and success (closed symbols) in Geology (left) and Physical Science (right) courses for the 13-14 through 18-19 academic years. AHC 6-year averages for retention and success (exclusive of winter semesters) are from the Physics-Astronomy program review for 18-19.

Success by discipline, gender, age, and ethnicity: As mentioned above and illustrated in Fig. 3, the success rates for students in Geology are lower than those in Physical Science and also a bit lower than the average success rate at AHC during the period studied except during the 18-19 academic year.

Success rates for students across the entire program (GEOL + PHSC) are similar for males and females and close to 70% during this period except in the 16-17 and 17-18 academic years when males lagged 5 to 10% behind females (Fig. 4). This trend persisted in 18-19, although the male success rate climbed above 70%.

Success rates for students in all age groups are within about 10% of one another and close to 70% (Fig. 5) during the period studied, although success rates for students <20 years old have typically been a bit lower than those of other age groups. This trend did not persist in 18-19.

Success rates in the program are similar for students of different ethnicities (Fig. 6) and close to 70% except during the 14-15 academic year when the rates for Hispanic and Other Underrepresented students were 15-20% below that of their non-Hispanic Caucasian classmates.

Finally, success rates for continuing, returning, and special admit students typically meet or exceed a 70% threshold with the latter two categories being somewhat more variable because of the relatively small numbers of students they include. Success rates for first-time and first-time transfer students are somewhat lower than for other groups (except during 13-14). The Physics and Astronomy faculty observe a similar trend in that program and suggest that it may reflect these students' lack of experience with the demands of college-level work.

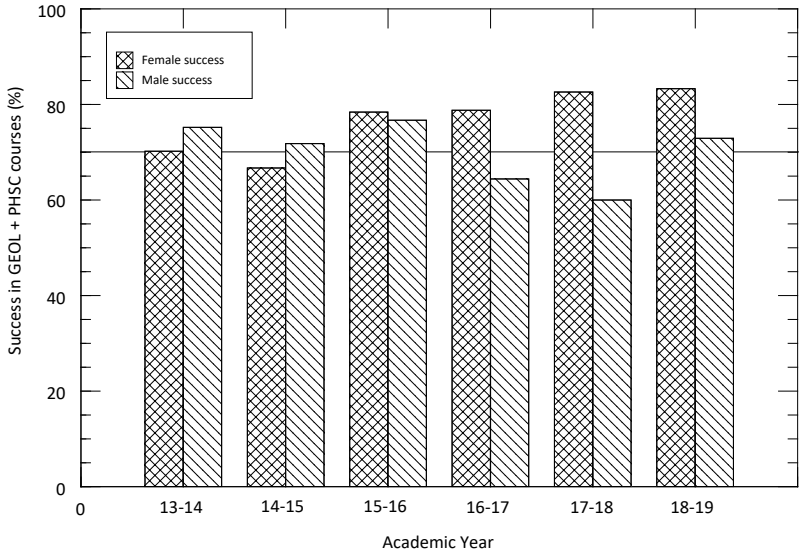


Figure 4: Percentages of students enrolled in Geology and Physical Science courses who were successful by gender and academic year.

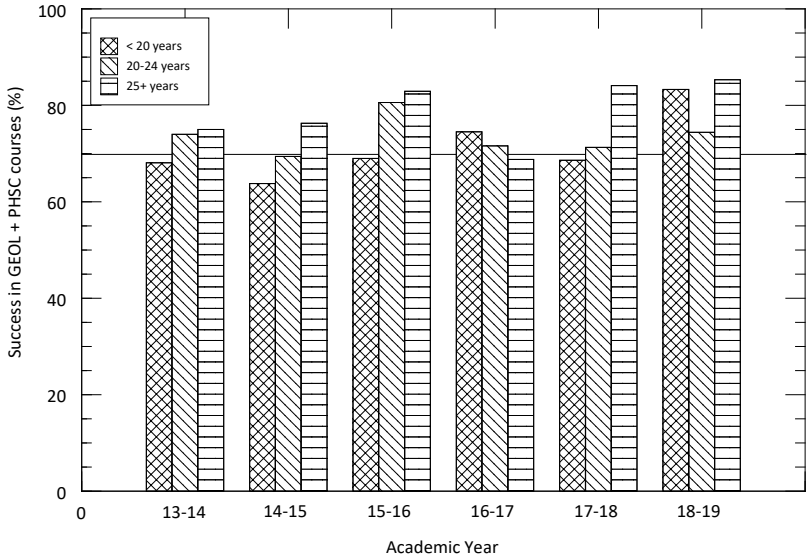


Figure 5: Percentages of students enrolled in Geology and Physical Science courses who were successful by age and academic year.

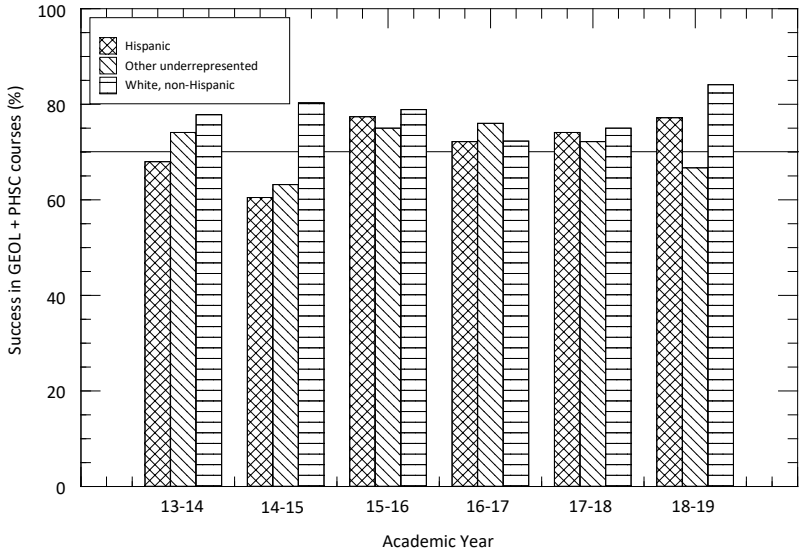


Figure 6: Percentages of students enrolled in Geology and Physical Science courses who were successful by ethnicity and academic year.

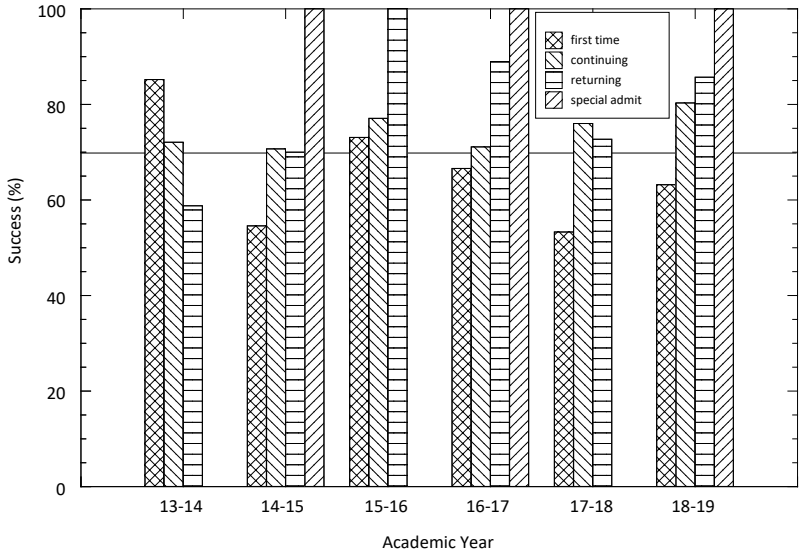


Figure 7: Percentages of students enrolled in Geology and Physical Science courses who were successful by student type and academic year.

Reasons for trends and planned actions:

Success by discipline: Student preparation may account for part of the difference in success rates between Geology and Physical Science because although ENGL 101 and MATH 311 are prerequisites for the Physical Science courses they are either advisories or not listed as requisites at all for Geology courses. The revised course outlines written in conjunction with this program review propose making ENGL 101 and MATH 311 advisories for *all* the semester-length Geology courses. If the discrepancies in success rates persist, however, making ENGL 101 and MATH 311 prerequisites for the semester-length Geology courses may be an appropriate next step.

Success by gender, age, ethnicity, and student type: For the most part there are neither large nor systematic differences among student success rates based on gender, age, or ethnicity in Geology and Physical Science. A group that has a success rate below 70% one year may have a markedly higher rate the next and vice versa; this may simply be a consequence of natural fluctuations in the student population of this program, which typically serves a couple of hundred students each year. The generally lower success rates of first-time students are similar to those in other sciences (astronomy, biology, chemistry, and physics) and highlight the importance of programs designed to support these students and help them transition to college academics.

VII. Trend Analyses/Outlook: Using the information already gathered in the Annual Updates (e.g., enrollment and achievement data; student learning outcomes assessment and analysis; input by advisory boards; existing articulation agreements; labor market trends) summarize the major trends, challenges, and opportunities that have emerged in the program since the last comprehensive program review. Explain possible causes for any identified gaps or trends and actions taken or needed to address these. As applicable, please address the breadth, depth, currency, and cohesiveness of the curriculum in relation to evolving employer needs and/or transfer requirements, as well as other important pedagogical or technology-related developments and actions taken or needed to address these.

Trends, challenges, and opportunities:

Employment opportunities for students who earn degrees in the geosciences are expected to: (1) increase at a rate equal to or slightly greater than the average rate of job growth in the United States during the

next 10 years (6%) and (2) yield median salaries of $81-92K/year, which is 2 to 3 times the median salary for an average job ($39K/year) according to the U.S. Bureau of Labor Statistics (https://bls.gov). The number of new geoscientists and hydrologists who will be hired to work on problems related to alternative energy, environmental protection, and land and resource management is anticipated to more than offset the losses expected in traditional geoscience careers such as mining, quarrying, and oil and gas production.

Similarly, Physical Science courses are required for teachers and, although elementary and high-school teaching jobs are expected to grow at a slightly lower rate (4%) than the average for U.S. jobs during the next 10 years, these careers yield median salaries ($60K/year) that are about 1.5 times that of an average job.

Both Geology and Physical Science, therefore, offer positive employment outlooks for students who complete bachelor's or, in some cases, master's degrees. Geology, in particular, tends to recruit students through field trip experiences, so supporting and expanding AHC's existing field courses in these disciplines (GEOL 199A-D and PHSC 199A-H) presents an opportunity to grow enrollment.

Breadth, depth, currency, and cohesiveness of the curriculum:
The breadth, depth, currency, and cohesiveness of AHC's Geology curriculum would be improved by: (1) adding a Historical Geology lab course and (2) developing an AS-T degree in Geology so that potential geoscience majors could complete their lower-division coursework at AHC and then transfer more easily to geology programs at CSU, UC, and other colleges and universities.

The breadth, depth, currency, and cohesiveness of AHC's Physical Science program is generally adequate but current faculty have expressed concerns that (1) the lab components of PHSC 111 and 112 need to be improved and (2) increasing demand for these courses from elementary school teachers means the discipline may benefit from expanding its offerings.

Pedagogical or technology-related developments:
The Geology/Physical Science program does not currently offer any distance learning courses, so modifying Oceanography (or, perhaps, Environmental Geology or Geology of California) for Distance Learning presents an opportunity to serve a wider range of students in the future.

VIII. Long-Term Program Goals and Action Plans (aligned with the College educational master plan):

Describe the long-term plans for changing or developing new courses and programs, other actions being taken to enhance student success, and the need for professional development activities and other resources to implement program goals. Be sure to show how these plans are related to assessment results. (Plan should cover a five-year period and include target dates and resources needed.)

Long-term Goal	Needs and Timeline
1. Hire a new full-time faculty member to assume responsibility for the Geology program, teach Geology and Physical Science courses, and improve the Geology Program (i.e. work on items in right-hand column that "require faculty member to…").	1. Requires: Full-time instructional salary and benefits. Timeline: Hire during the 2020-2021 academic year so that he or she could assume duties beginning fall 2021.
2. Add Historical Geology course so that the Geology program can (1) offer a second lab class to serve both majors and general	2. Requires: Faculty member to guide course through review process, plan labs, purchase new lab materials (rock and fossil samples,

education students and (2) offer an AS-T degree in Geology that will potentially attract additional students to the program.	maps, etc.) Timeline: Propose, review, and prepare class during 2021-2022; offer beginning fall 2023 or spring 2024.
3. Develop and receive approval for an AS-T degree in Geology to enable geology majors to complete their basic coursework in the discipline at AHC and facilitate their transfers to university and 4-year college geology programs.	3. Requires: Faculty member to work with other faculty and staff to guide the Geology AS-T proposal through the Chancellor's Office review and promote the new degree. Timeline: Review proposal and submit for Chancellor's Office approval during 2021-2022 academic year.
4. Add a full lab component to at least one of the existing non-lab Geology courses (Oceanography or Environmental Geology). This change is supported by PSLO data which indicate that students are more likely to meet or exceed standards for outcomes that are supported by laboratory (or field) activities.	4. Requires: Faculty member to revise the course outline, guide it through review process, plan labs, purchase new lab materials. Timeline: Propose, review, and prepare class during 2020-2021; offer beginning during 2021-2022 academic year.
5. Revise the course outline of one of the existing non-lab Geology courses (e.g. Oceanography, Environmental Geology) to adapt it for distance learning so that it can serve distance students.	5. Requires: Faculty member to revise course outline for distance learning. Timeline: Revise outline during 2021-2022 academic year with the goal offering the class online in 2022-2023.
6. Increase involvement of Earth Science students in the MESA program to address deficiencies in the numbers of women and ethnic minorities earning geoscience degrees today.	6. Requires: Faculty member to work with MESA staff to engage Earth Science students in the program. Development of a Geology AS-T will likely increase urgency of MESA involvement. Timeline: Begin fall 2022.
7. Develop a plan to offer student internships with local environmental consulting firms and related businesses after soliciting opinions from local employers (oil companies, U.S. Geological Survey, consulting firms, etc.) about the skills needed for Earth science jobs and incorporating this information would into the Geology/Physical Science curriculum. Internships are one important tool for engaging students and preparing them for careers in the sciences (e.g. Phys21).	7. Requires: Faculty member to gather information from local employers, modify the Geology/Physical Science curriculum to incorporate relevant changes (e.g. see item 11 below), set up internships, monitor student progress, and revise the program as necessary. Timeline: Begin information gathering in 2022-2023; update courses in 2023-2024; create and monitor internship program during 2024-2025 and beyond.
8. Develop and offer a Life and Physical Sciences speaker series with monthly presentations for interested members of the community by faculty or students that explore current topics in science or the results of student or faculty research. Again, the opportunity for students to present and discuss scientific concepts orally is critical for science careers (e.g. Phys21).	8. Requires: Faculty member to develop format for presentations, schedule a presentation space, recruit speakers, and moderate. Timeline: Plan speaker series fall 2021; presentations begin spring 2022.
9. Develop and offer (1) "Semester Abroad" courses; (2) an Honors Geology course (GEOL 188); or (3) a (short) course in Geophysics that specifically targets MESA students enrolled in Physics courses and includes a field methods component that gives students experience using geophysical equipment. These are "aspirational" goals carried over	9. Requires: Faculty member to research new course/courses, guide it/them through the review process, plan labs, and secure funding for new instructional materials and equipment. Timeline: 2022-2023 and beyond.

from the 2007-2008 Geology/Physical Science program review and accomplishing any one of them will likely take several years. They are all related to the previous full-time instructor's observation that geology and physical science students most often met or exceeded those PSLOs that were supported by lab (or field) activities.	
10. Improve support for student participation in Geology and Physical Science field trips, which are a unique part of the discipline's curriculum and an important tool for recruiting new students to the program, by providing transportation.	10. Requires: Requires purchase of two or three vans to transport students on geology and physical science field trips for regional (GEOL 199/PHSC 199) and other (e.g. Oceanography, Physical Geology) courses. Timeline: If added to the proposed budget in 2021-2022, the bus or vans could be purchased and be in service for trips in 2022-2023 academic year.
11. Afford students opportunities to use and become familiar with GPS and GIS, technologies that are widely used in the Earth and environmental sciences today, in their introductory geology courses.	12. Requires: Purchase of a site license for ArcGIS and perhaps compatible laptops and additional GPS receivers (in cooperation with the agriculture program) to introduce students to these widely used technologies. Timeline: Laptops, GPS receivers, and the ArcGIS subscription could be proposed in the 2021-2022 budget and, if funded, be purchased and integrated into courses in 2022-2023.

Section 2: Student Data Summary (Self-study Team)

1. Student Data

State at least three positive factors about the program identified in student surveys (p. 16-22). Include the number (or percentage) of students responding and any implications for planning.

Students were particularly positive about: the contribution the geology program made to their intellectual growth (95% somewhat or highly satisfied); the way the program met their educational goals (88%); and the quality of instruction in the geology program (82%). They were also very positive about the program's: clarity of course goals and learning objectives (83%); physical facilities and space (82%); and instructional equipment (87%). These high student satisfaction percentages suggest that instruction in the geology program is effective and meets student needs as it is currently being offered. In addition, the high rating for instructional facilities and equipment argues that every effort should be made to schedule geology classes (especially lab classes such as *Physical Geology* and *Historical Geology*) in the dedicated geology lab.

State at least three negative factors about the program identified in student surveys. Include the number (or percentage) of students responding and any implications for planning.

Students were less positive about: the assistance they received with geology courses through tutorial services (45% somewhat or highly satisfied); the "content" of courses offered in the geology program (54%); the advice they received about the program from counselors (58%); and the availability of courses in the geology program (60%). It's a little unclear what course "content" means in this context: if it means the range of topics covered in individual geology courses then this low score seems to be at odds with earlier scores for instructional quality. If, on the other hand, "content" means the overall variety of courses offered in the program this answer is consistent with the low satisfaction rate for the availability of geology courses. Offering a greater variety of courses on a regular schedule will be one benefit of hiring a new full-time geology instructor. Issues with tutorial services and advising are also ones that the new instructor can work on via outreach to student services staff in those areas.

State any other information (use responsive numbers) that you obtained from student data (e.g. focus groups, questionnaires, or SGIDs) that may be of special interest to the self-study team. What planning implications will result from this information?

Two other points stand out in the survey data: (1) geology students are very likely to recommend taking courses in the program to others (76% strongly or somewhat agree), which is consistent with their overall satisfaction with its instructional quality; and (2) most students (75%) currently take geology courses to meet general education requirements. Hiring of a full-time geology instructor may result in this number decreasing as new geology majors are recruited.

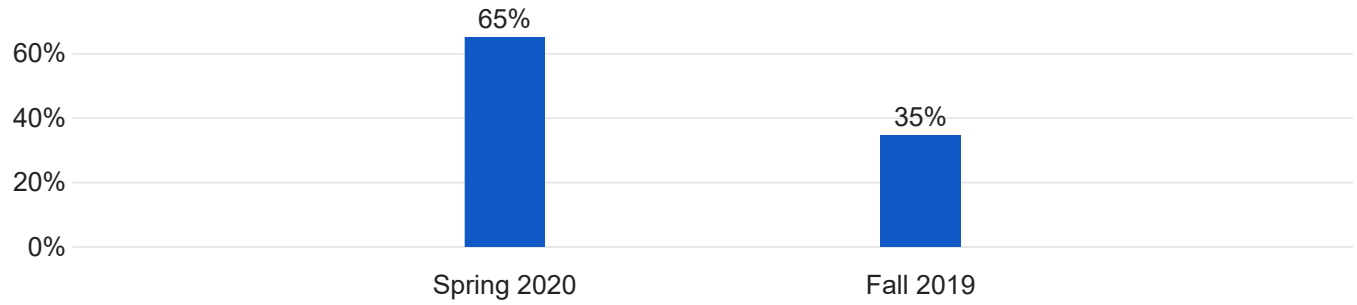
2. Statistics

Information on student outcomes, demographics, equity, program efficiency, and faculty load and type (p. 23-34) was taken from Allan Hancock College's institutional data site for the Geology/Physical Science program (https://www.hancockcollege.edu/ie/programdata.php) on 14-Jul-2020. Tables 1 and 2, which summarize student outcomes on Physical Science and selected Geology PSLOs, respectively, are on pages 35 and 36. They were provided as follow up to my conference with discipline faculty in May 2020.

Geology Fall 19/Spring 20 Program Review

When were you last enrolled in a Geology course?

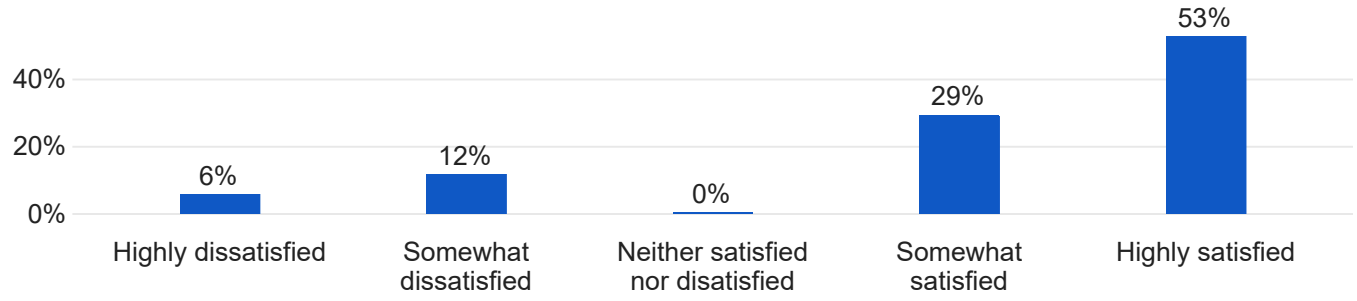
23 Responses



Part I. Answer to the best of your ability the following questions. Please indicate how satisfied you are, in general, with the following aspects of the Geology Program.

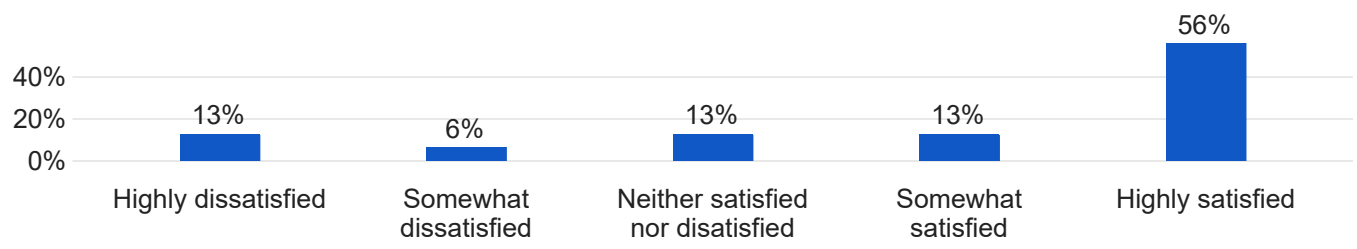
Quality of instruction within the program

17 Responses

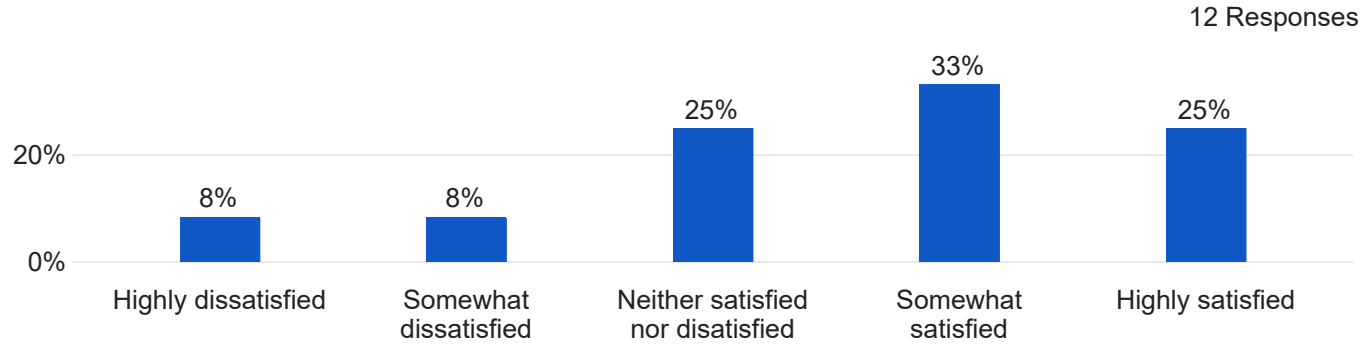


The way textbooks and other materials used in courses within the program help me learn

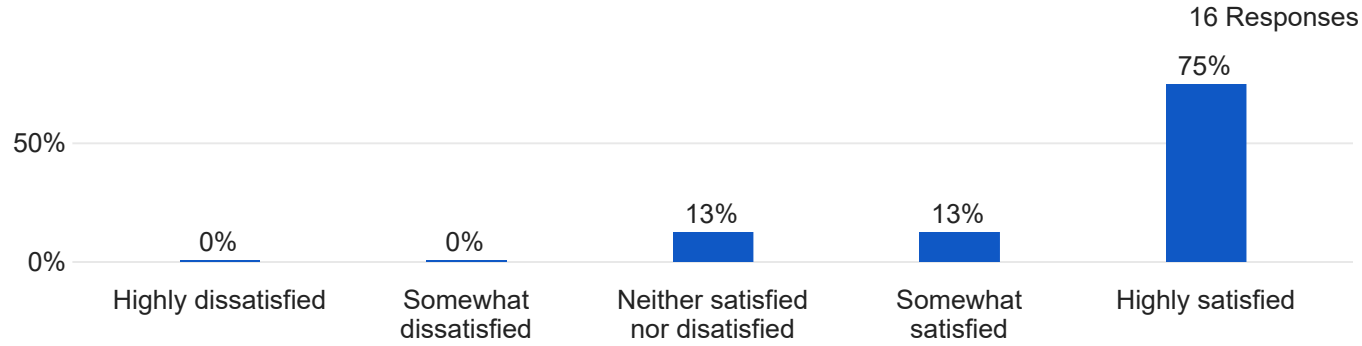
16 Responses



Advice about the program from counselors

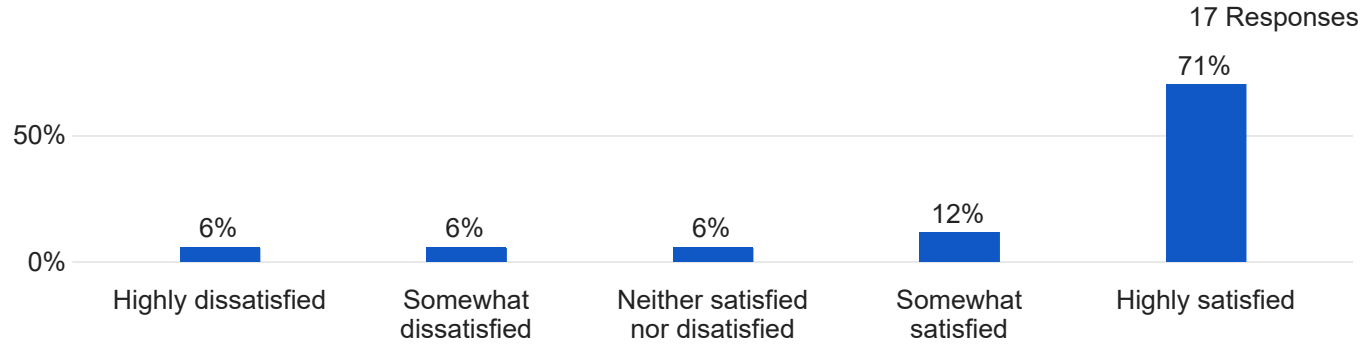


The way this program meets your educational goals

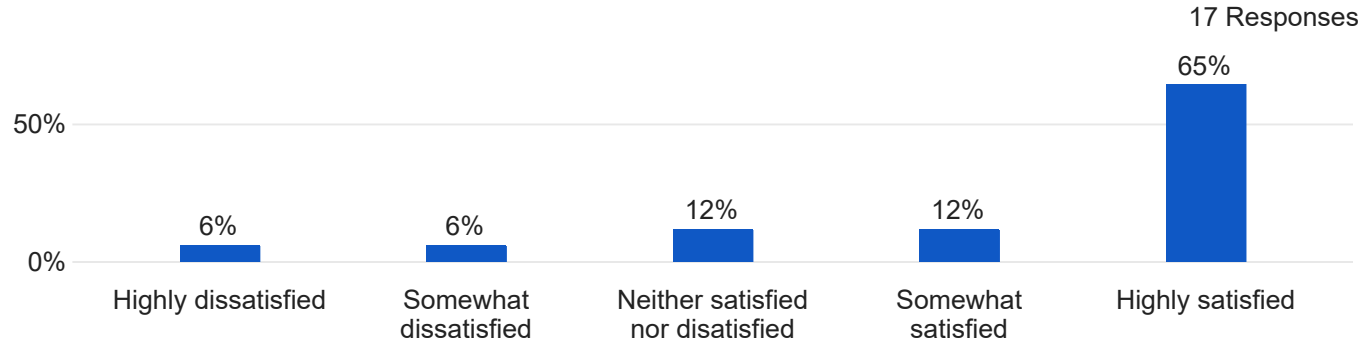


Contribution towards your intellectual growth

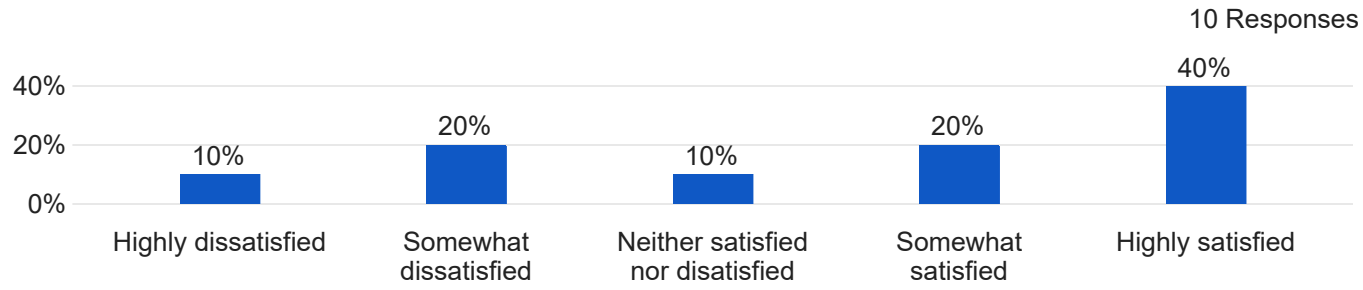
Clarity of course goals and learning objectives



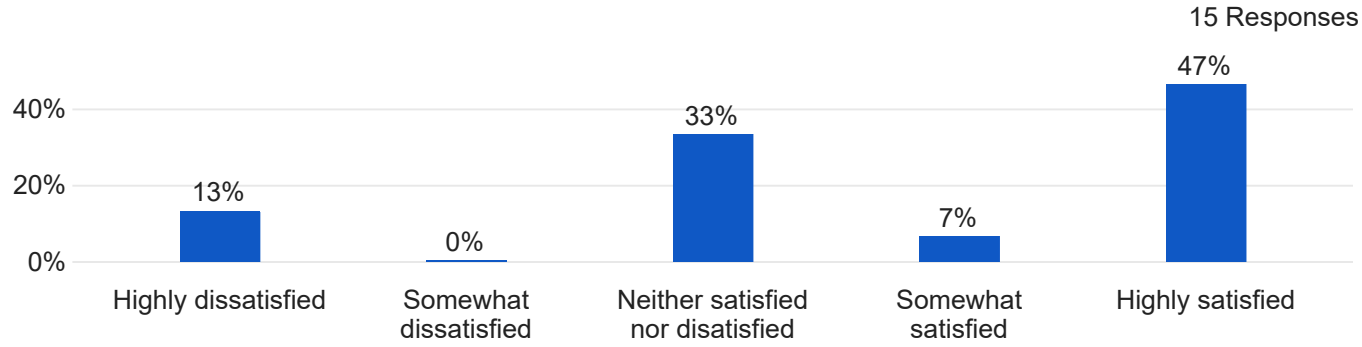
Feedback and assessment of progress towards learning objectives



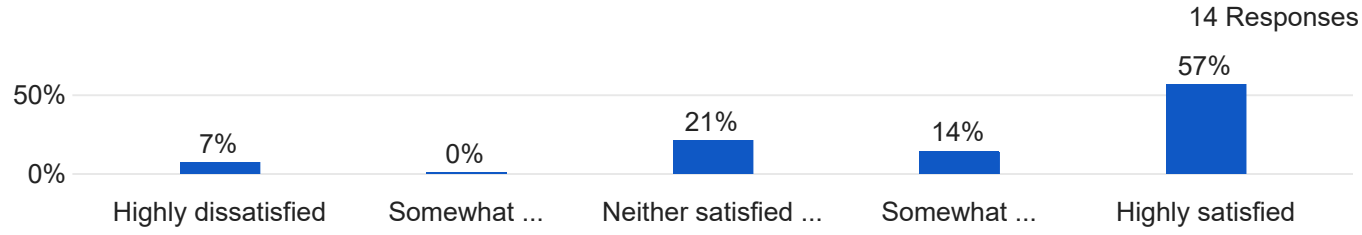
The availability of courses offered in the Geology Program



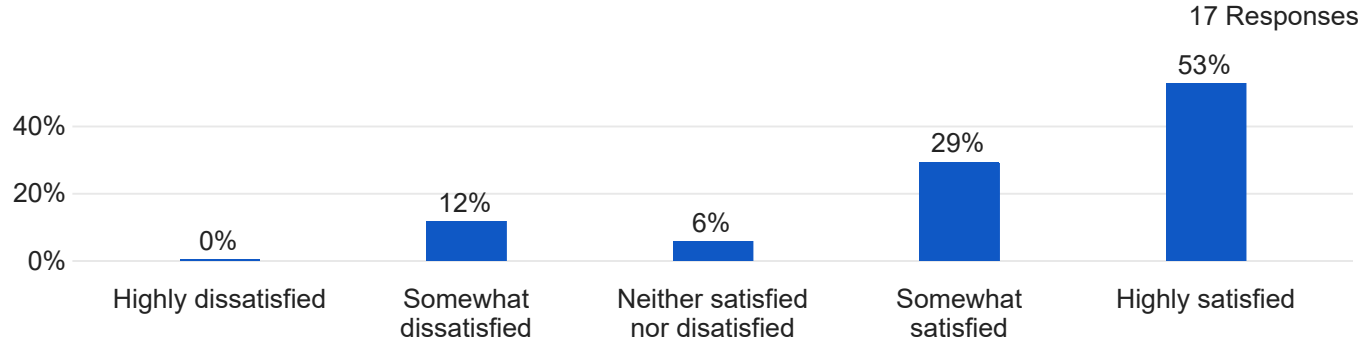
The content of courses offered in the Geology Program



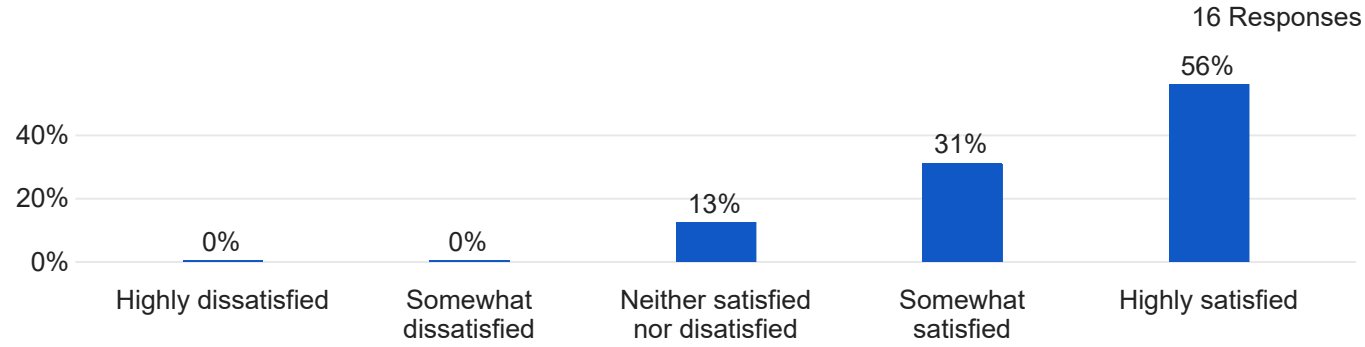
The coordination of courses offered in the Geology Program and courses offered in other departments that may be required for your major



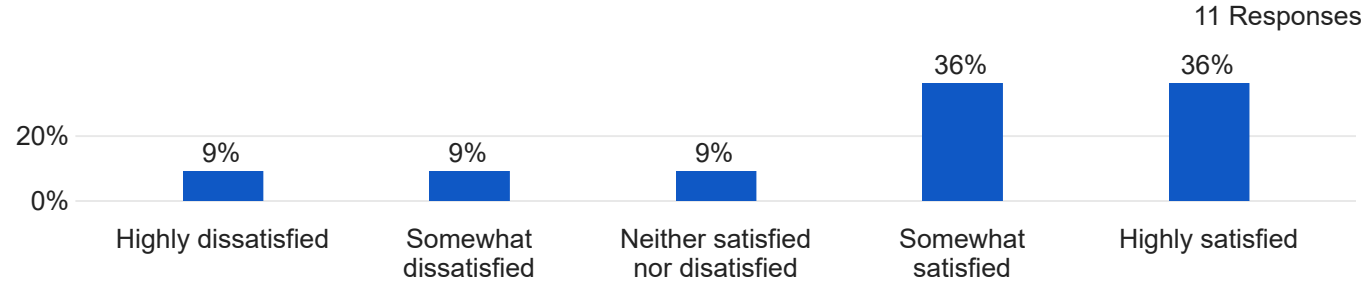
The physical facilities and space (e.g., classrooms, labs)



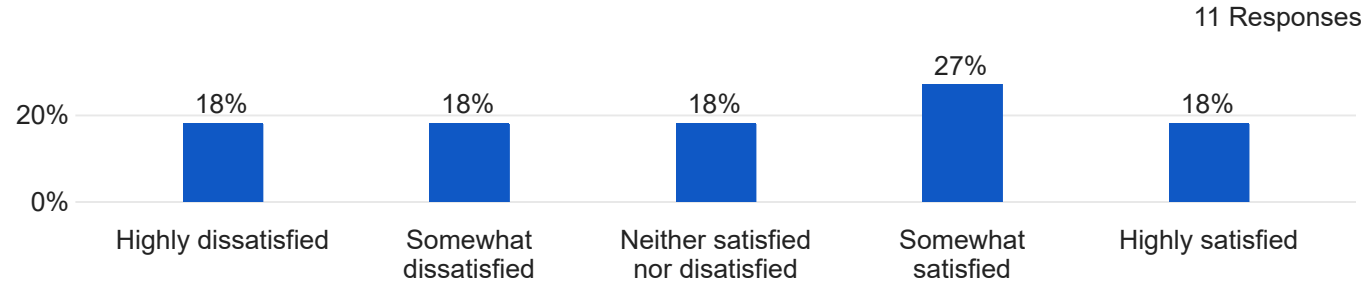
Instructional equipment (e.g., computers, lab equipment)



Presentation of classes via the college's Canvas course management system

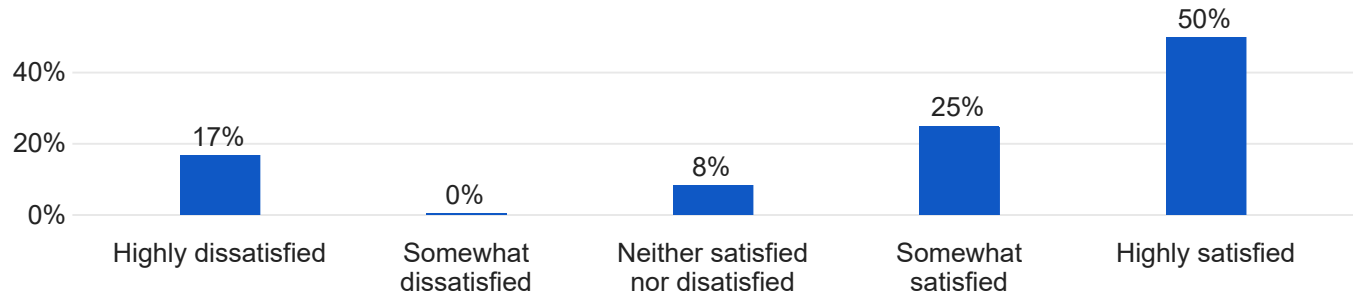


Course assistance through tutorial services (e.g through the Tutorial Center, Math Lab, Writing Center)



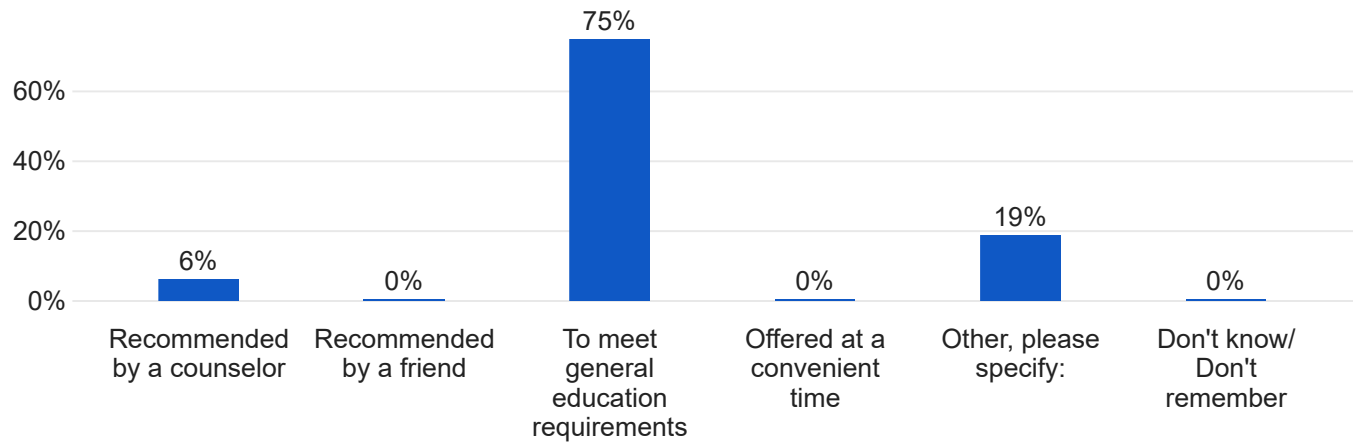
Availability of appropriate resources in the libraries

12 Responses



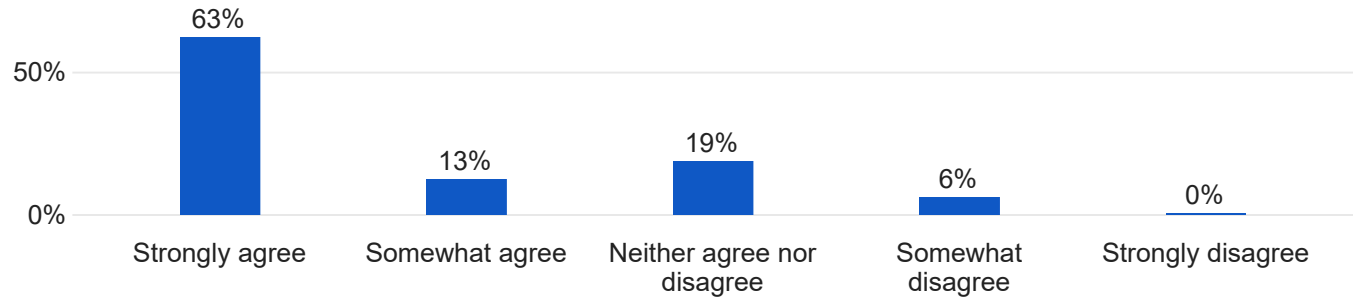
Which of the following best describes your reason for taking this and other courses in the Geology Program? - Selected Choice

16 Responses



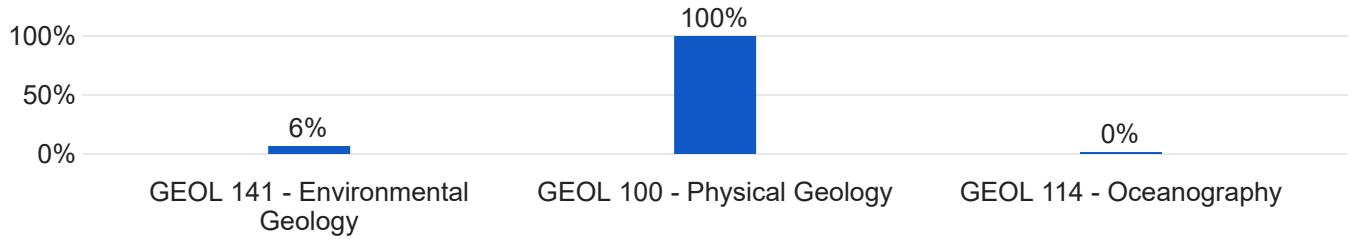
I would recommend taking courses in the Geology Program

16 Responses



Which of the following courses have you taken in the Geology Program? (Check all that apply)

16 Responses



2a: Outcomes — all Geology and Physical Science

1 Outcomes GEOL

course_: (All)

	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018	Spring 2019
Sections	4	5	4	3	5	4	4	5	6	4	3	4
Headcount	103	131	103	74	106	80	85	96	114	94	74	92
Enrollment	103	145	104	77	112	80	85	102	124	94	74	92
retained	85	125	82	70	95	76	67	87	111	77	66	77
Retention %	83%	86%	79%	91%	85%	95%	79%	85%	90%	82%	89%	84%
success	78	102	68	57	84	65	57	77	96	66	61	70
Success %	76%	70%	65%	74%	75%	81%	67%	75%	77%	70%	82%	76%
FTES	19.0	22.1	19.5	11.2	20.1	15.2	15.7	18.9	21.8	17.7	15.7	16.8

Outcomes Allan Hancock College Credit

	Sum 2013	Fall 2013	Spring 2014	Sum 2014	Fall 2014	Spring 2015	Sum 2015	Fall 2015	Winter 2016	Spring 2016	Sum 2016	Fall 2016	Winter 2017	Spring 2017	Sum 2017	Fall 2017	Winter 2018	Spring 2018	Sum 2018	Fall 2018	Winter 2019	Spring 2019
Sections	285	1,069	1,141	306	1,141	1,209	355	1,177	41	1,220	357	1,184	41	1,214	333	1,168	45	1,186	270	1,145	47	1,159
Headcount	5,421	10,922	11,293	5,185	11,084	11,249	5,593	10,982	1,051	11,341	4,354	12,111	1,023	11,636	5,306	11,889	1,118	11,320	4,596	11,380	1,171	10,580
Enrollment	8,455	28,612	29,369	8,168	29,153	28,984	8,789	28,471	1,270	28,153	8,305	29,268	1,314	28,161	8,052	28,754	1,480	26,960	6,868	28,650	1,535	26,193
Retention %	89.1%	87.0%	85.2%	89.4%	86.8%	85.4%	89.6%	86.4%	84.4%	89.4%	90.4%	88.0%	86.5%	88.1%	90.3%	87.0%	87.2%	88.1%	90.3%	87.1%	87.8%	87.6%
Success %	77.5%	70.6%	70.2%	77.7%	69.8%	71.4%	77.4%	70.2%	70.6%	73.2%	79.6%	71.5%	77.2%	74.0%	80.3%	71.5%	78.9%	74.1%	79.6%	71.3%	79.2%	73.5%
FTES	978	3,852	3,868	944	3,900	4,048	1,009	3,807	111	3,715	967	4,197	115	4,020	900	4,126	139	3,869	835	4,061	169	3,827

2a: Outcomes— Geology 100: Physical Geology

1 Outcomes GEOL

course_: GEOL100

	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018	Spring 2019
Sections	2	1	2	1	2	2	2	2	2	2	2	2
Headcount	52	28	56	24	46	39	44	43	44	48	47	44
Enrollment	52	28	56	24	46	39	44	43	44	48	47	44
retained	44	21	46	22	38	37	34	32	39	37	40	39
Retention %	85%	75%	82%	92%	83%	95%	77%	74%	89%	77%	85%	89%
success	41	17	40	17	31	29	28	28	30	30	35	36
Success %	79%	61%	71%	71%	67%	74%	64%	65%	68%	63%	74%	82%
FTES	11.02	5.89	11.88	5.05	9.76	8.26	9.34	9.13	9.33	10.19	9.97	9.34

2a: Outcomes — GEOL 114: Oceanography

1 Outcomes GEOL

course_ GEOL114

	Spring 2014	Spring 2015	Spring 2016	Spring 2017	Spring 2018	Spring 2019
Sections	1	1	1	1	1	1
Headcount	28	27	16	12	16	19
Enrollment	28	27	16	12	16	19
retained	23	24	14	10	12	12
Retention %	82%	89%	88%	83%	75%	63%
success	15	19	11	9	8	10
Success %	54%	70%	69%	75%	50%	53%
FTES	2.96	0.67	1.71	1.24	1.25	1.31

2a: Outcomes— Geology 131: Geology of California

1 Outcomes GEOL

course_ GEOL131

	Spring 2014
Sections	1
Headcount	29
Enrollment	29
retained	22
Retention %	76%
success	17
Success %	59%
FTES	3.10

2a: Outcomes— Geology 141: Environmental Geology

1 Outcomes GEOL

course_ GEOL141

	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
Sections	1	1	1	1	1
Headcount	26	23	17	21	22
Enrollment	26	23	17	21	22
retained	19	16	12	16	17
Retention %	73%	70%	71%	76%	77%
success	15	11	8	12	15
Success %	58%	48%	47%	57%	68%
FTES	2.69	2.38	1.76	2.18	2.28

2a: Outcomes — Physical Science 111: Matter, Energy, and Molecules

1 Outcomes GEOL

course_ PHSC111

	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018
Sections	1	1	1	1	1	1
Headcount	25	25	22	20	29	27
Enrollment	25	25	22	20	29	27
retained	22	20	18	17	26	26
Retention %	88%	80%	82%	85%	90%	96%
success	22	17	18	17	26	26
Success %	88%	68%	82%	85%	90%	96%
FTES	5.26	5.26	4.63	4.21	6.10	5.68

2a: Outcomes— Physical Science 112: Earth and Universe

1 Outcomes GEOL

course_ PHSC112

	Spring 2014	Spring 2015	Spring 2016	Spring 2017	Spring 2018	Spring 2019
Sections	1	1	1	1	1	1
Headcount	29	26	25	27	30	29
Enrollment	29	26	25	27	30	29
retained	28	24	25	25	28	26
Retention %	97%	92%	100%	93%	93%	90%
success	25	21	25	22	28	24
Success %	86%	81%	100%	81%	93%	83%
FTES	6.10	5.47	5.26	5.68	6.31	6.10

2a: Outcomes— Physical Science 199E: Geology of Death Valley

1 Outcomes GEOL

course_ PHSC199E

	Spring 2014	Spring 2017
Sections	1	1
Headcount	31	20
Enrollment	31	20
retained	31	20
Retention %	100%	100%
success	28	18
Success %	90%	90%
FTES	4.05	2.90

2a: Outcomes — Physical Science 199G: Geology of Eastern Sierra Nevada

1 Outcomes GEOL

course_ PHSC199G

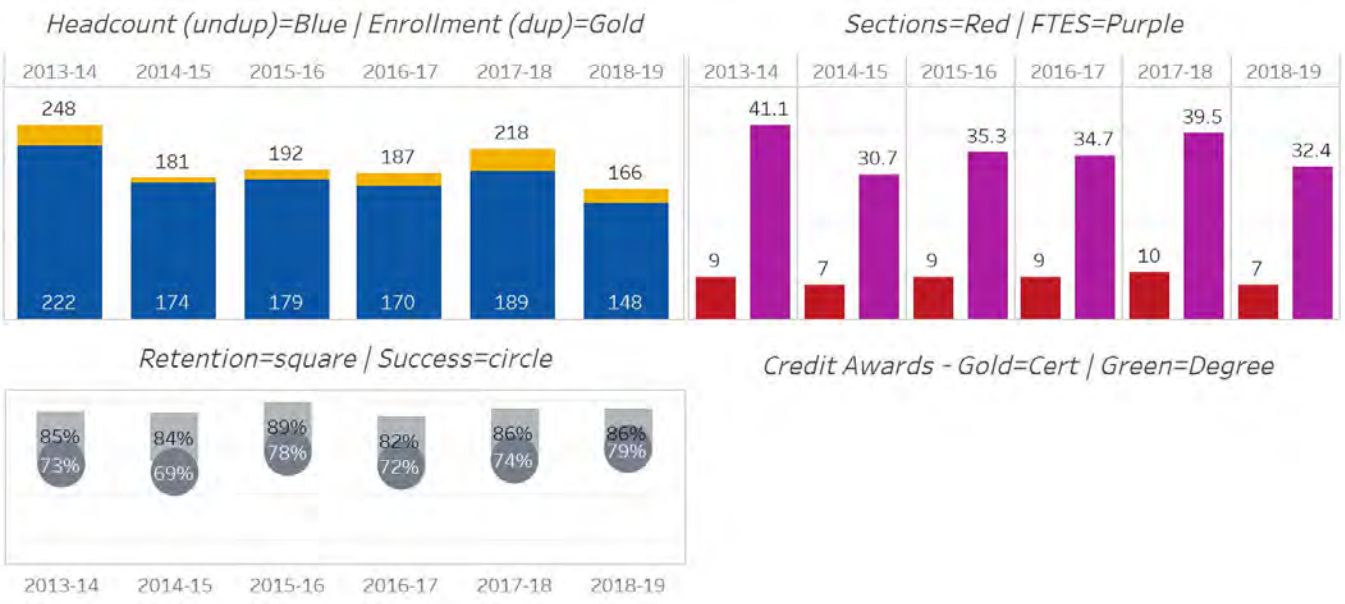
	Fall 2015	Fall 2017
Sections	1	1
Headcount	27	28
Enrollment	27	28
retained	27	28
Retention %	100%	100%
success	27	24
Success %	100%	86%
FTES	3.91	3.91

2a: Outcomes— Physical Science 199H: Geology of Eastern Sierra Nevada — Advanced Studies

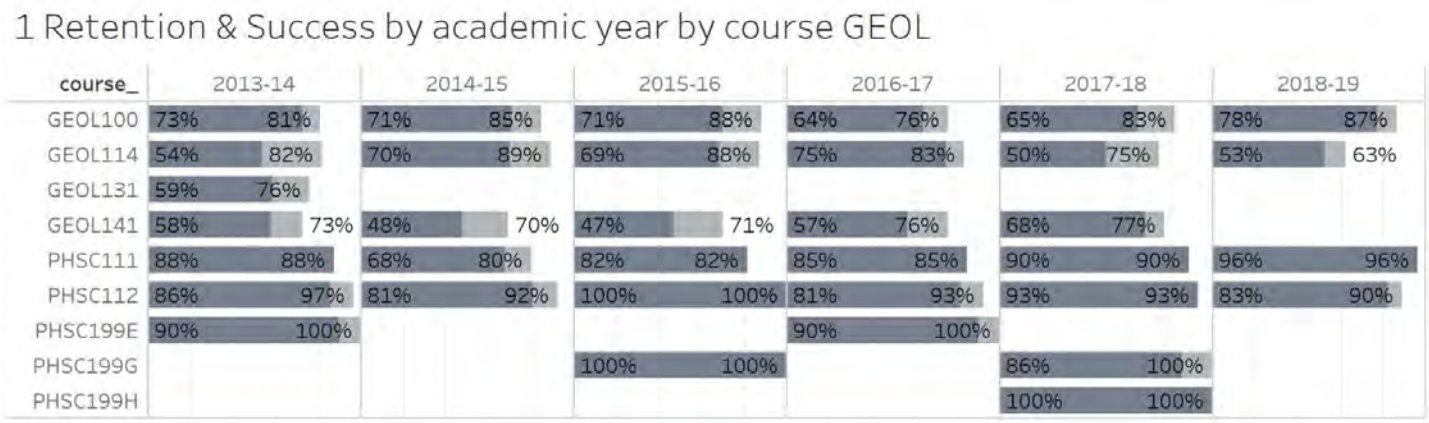
1 Outcomes GEOL

course_ PHSC199H

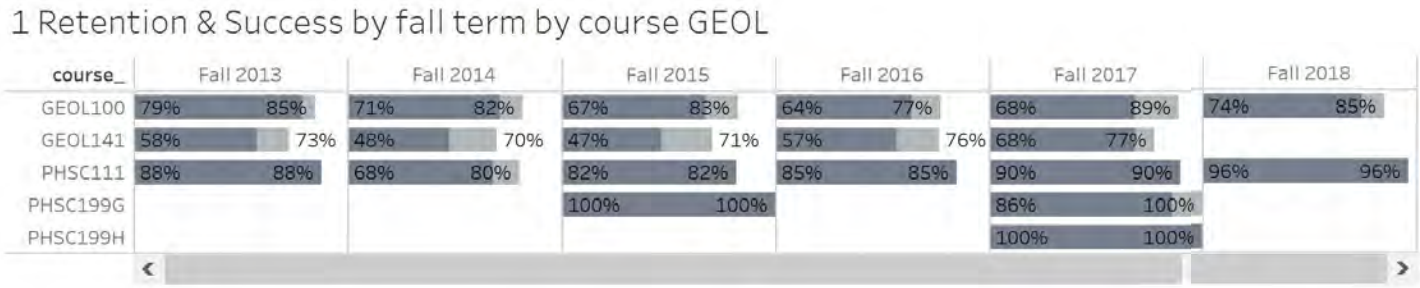
	Fall 2017
Sections	1
Headcount	1
Enrollment	1
retained	1
Retention %	100%
success	1
Success %	100%
FTES	0.1448



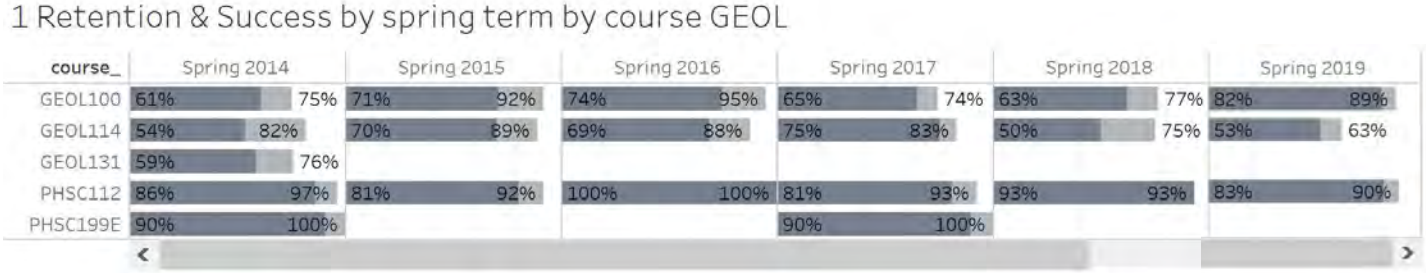
2a: Outcomes — Geology and Physical Sciences all courses 2013-2014 to 2018-2019



2a: Outcomes — Geology and Physical Sciences fall courses 2013 to 2018



2a: Outcomes — Geology and Physical Sciences spring courses 2014 to 2019



2b: Demographics — Geology and Physical Science: all courses

2 Program Demographics GEOL

course_
(All)

Choose individual course via filter or see Appendix A for full demographic course details

Academic Year

	2013-14		2014-15		2015-16		2016-17		2017-18		2018-19	
Age Category	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES
Under 20	63	11.1	56	9.8	58	10.4	50	9.0	45	9.5	39	8.0
20-24	119	22.0	82	14.2	83	17.5	82	16.6	93	19.6	81	17.8
25-29	18	3.8	13	2.1	22	4.2	20	4.8	22	4.4	13	2.4
30-34	8	1.6	13	2.9	8	1.7	5	1.5	11	2.0	7	1.7
35-39	5	0.9	4	0.6	4	0.7	3	0.6	7	1.4	4	1.0
40-49	6	1.2	5	1.0	3	0.4	5	1.1	11	2.3	6	1.1
50+	3	0.6	1	0.2	2	0.3	5	1.0	3	0.4	2	0.4

	2013-14		2014-15		2015-16		2016-17		2017-18		2018-19	
ETHNICITY	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES
Asian	9	1.7	3	0.3	3	0.5	8	1.7	2	0.4	2	0.4
Black			4	0.8	4	0.7	5	0.9	7	1.2	4	0.9
Filipino	6	1.0	6	1.1	6	1.1	6	1.3	6	0.7	7	1.5
Hispanic	112	20.9	84	14.6	105	22.0	90	18.5	98	22.0	66	15.7
NativeAm	7	1.3	5	0.8	5	0.9	3	0.6	3	0.5	3	0.6
PacIsl	1	0.1			2	0.4	1	0.2			2	0.4
White	87	16.1	72	12.9	54	9.6	57	11.5	73	14.6	64	12.9

	2013-14		2014-15		2015-16		2016-17		2017-18		2018-19	
	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES
Female	117	21.5	93	15.9	92	18.4	88	17.9	114	25.7	80	19.4
Male	105	19.6	81	14.8	87	16.9	81	16.6	75	13.8	68	13.0
Unknown							1	0.2				

	2013-14		2014-15		2015-16		2016-17		2017-18		2018-19	
	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES	Headcount	FTES
First Time	13	2.2	19	2.9	14	2.1	13	2.3	11	2.1	12	2.2
First Time Transfer	12	2.5	3	0.6	10	2.5	9	1.9	3	0.5	7	1.5
Continuing	184	34.1	140	24.9	147	29.1	140	28.3	164	35.1	120	26.8
Returning	15	2.3	10	2.1	8	1.6	7	1.8	11	1.8	7	1.3
Special Admit			2	0.2			2	0.4			3	0.6
Grand Total	222	41.1	174	30.7	179	35.3	170	34.7	189	39.5	148	32.4

2c: Equity — Geology and Physical Science: all courses, success by age

Academic Year 2013-14

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Under 20	63	69	11.1	89.9%	7.2%		68.1%	-6.2%	5
20-24	119	131	22.0	82.4%	-4.7%	7	74.0%	3.1%	
25-29	18	21	3.8	81.0%	-4.1%	1	76.2%	3.9%	
30-34	8	9	1.6	100.0%			88.9%		
35-39	5	5	0.9	60.0%			40.0%		
40-49	6	8	1.2	75.0%			75.0%		
50+	3	5	0.6	100.0%			80.0%		
Grand Total	222	248	41.1	84.7%			72.6%		

Academic Year 2014-15

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Under 20	56	58	9.8	82.8%	-1.8%	2	63.8%	-7.8%	5
20-24	82	85	14.2	84.7%	1.4%		69.4%	0.7%	
25-29	13	13	2.1	92.3%	9.0%		92.3%	25.0%	
30-34	13	14	2.9	78.6%	-5.9%	1	64.3%	-5.2%	1
35-39	4	4	0.6	50.0%			50.0%		
40-49	5	6	1.0	100.0%			100.0%		
50+	1	1	0.2	100.0%			0.0%		
Grand Total	174	181	30.7	84.0%			69.1%		

Academic Year 2015-16

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Under 20	58	58	10.4	89.7%	0.8%		69.0%	-12.4%	8
20-24	83	93	17.5	90.3%	2.4%		80.6%	5.9%	
25-29	22	23	4.2	87.0%	-2.4%	1	82.6%	5.7%	
30-34	8	9	1.7	88.9%			88.9%		
35-39	4	4	0.7	75.0%			75.0%		
40-49	3	3	0.4	66.7%			66.7%		
50+	2	2	0.3	100.0%			100.0%		
Grand Total	179	192	35.3	89.1%			77.6%		

Academic Year 2016-17

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Under 20	50	51	9.0	88.2%	8.1%		74.5%	3.9%	
20-24	82	88	16.6	80.7%	-3.2%	3	71.6%	-0.1%	1
25-29	20	25	4.8	72.0%	-12.0%	3	60.0%	-13.5%	4
30-34	5	8	1.5	100.0%			87.5%		
35-39	3	3	0.6	66.7%			66.7%		
40-49	5	6	1.1	83.3%			83.3%		
50+	5	6	1.0	83.3%			66.7%		
Grand Total	170	187	34.7	82.4%			71.7%		

Academic Year 2017-18

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Under 20	45	51	9.5	82.4%	-5.1%	3	68.6%	-7.4%	4
20-24	93	108	19.6	86.1%	-0.3%	1	71.3%	-6.0%	7
25-29	22	25	4.4	96.0%	11.0%		96.0%	24.5%	
30-34	11	11	2.0	90.9%	4.9%		63.6%	-11.2%	2
35-39	7	7	1.4	85.7%			85.7%		
40-49	11	13	2.3	84.6%	-1.7%	1	84.6%	11.0%	
50+	3	3	0.4	66.7%			66.7%		
Grand Total	189	218	39.5	86.2%			74.3%		

Academic Year 2018-19

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Under 20	39	42	8.0	85.7%	-0.6%	1	83.3%	5.9%	
20-24	81	90	17.8	83.3%	-6.1%	6	74.4%	-9.8%	9
25-29	13	13	2.4	92.3%	6.7%		84.6%	6.2%	
30-34	7	8	1.7	100.0%			75.0%		
35-39	4	5	1.0	100.0%			100.0%		
40-49	6	6	1.1	83.3%			83.3%		
50+	2	2	0.4	100.0%			100.0%		
Grand Total	148	166	32.4	86.1%			78.9%		

2c: Equity — Geology and Physical Science: all courses, retention and success by gender

Academic Year 2013-14

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Female	117	131	21.5	80.9%	-8.0%	11	70.2%	-5.0%	7
Male	105	117	19.6	88.9%	8.0%		75.2%	5.0%	
Grand Total	222	248	41.1	84.7%			72.6%		

Academic Year 2014-15

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Female	93	96	15.9	79.2%	-10.2%	10	66.7%	-5.1%	5
Male	81	85	14.8	89.4%	10.2%		71.8%	5.1%	
Grand Total	174	181	30.7	84.0%			69.1%		

Academic Year 2015-16

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Female	92	102	18.4	88.2%	-1.8%	2	78.4%	1.8%	
Male	87	90	16.9	90.0%	1.8%		76.7%	-1.8%	2
Grand Total	179	192	35.3	89.1%			77.6%		

Academic Year 2016-17

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Female	88	99	17.9	84.8%	5.3%		78.8%	15.2%	
Male	81	87	16.6	80.5%	-3.5%	4	64.4%	-13.6%	12
Unknown	1	1	0.2	0.0%			0.0%		
Grand Total	170	187	34.7	82.4%			71.7%		

Academic Year 2017-18

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Female	114	138	25.7	88.4%	5.9%		82.6%	22.6%	
Male	75	80	13.8	82.5%	-5.9%	5	60.0%	-22.6%	19
Grand Total	189	218	39.5	86.2%			74.3%		

Academic Year 2018-19

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Female	80	96	19.4	88.5%	5.7%		83.3%	10.5%	
Male	68	70	13.0	82.9%	-5.7%	4	72.9%	-10.5%	8
Grand Total	148	166	32.4	86.1%			78.9%		

2c3: Equity — Geology and Physical Science: all courses, retention and success by ethnicity

Academic Year 2013-14

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Asian	9	12	1.7	91.7%			58.3%		
Filipino	6	6	1.0	66.7%			66.7%		
Hispanic	112	122	20.9	82.0%	-5.3%	7	68.0%	-9.0%	11
Native Am	7	8	1.3	100.0%			100.0%		
Pac Isl	1	1	0.1	100.0%			100.0%		
White	87	99	16.1	86.9%	3.6%		77.8%	8.7%	
Grand Total	222	248	41.1	84.7%			72.6%		

Academic Year 2014-15

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Asian	3	3	0.3	33.3%			33.3%		
Black	4	4	0.8	75.0%			75.0%		
Filipino	6	7	1.1	100.0%			85.7%		
Hispanic	84	86	14.6	84.9%	1.7%		60.5%	-16.4%	15
Native Am	5	5	0.8	40.0%			40.0%		
White	72	76	12.9	86.8%	4.9%		80.3%	19.3%	
Grand Total	174	181	30.7	84.0%			69.1%		

Academic Year 2015-16

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Asian	3	3	0.5	100.0%			66.7%		
Black	4	4	0.7	75.0%			50.0%		
Filipino	6	6	1.1	83.3%			83.3%		
Hispanic	105	115	22.0	90.4%	3.4%		77.4%	0.5%	1
Native Am	5	5	0.9	100.0%			100.0%		
Pac Isl	2	2	0.4	100.0%			50.0%		
White	54	57	9.6	86.0%	-4.4%	3	78.9%	1.9%	
Grand Total	179	192	35.3	89.1%			77.6%		

Academic Year 2016-17

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Asian	8	9	1.7	77.8%			66.7%		
Black	5	5	0.9	80.0%			60.0%		
Filipino	6	7	1.3	100.0%			71.4%		
Hispanic	90	97	18.5	79.4%	-6.2%	6	72.2%	1.1%	
Native Am	3	3	0.6	100.0%			100.0%		
Pac Isl	1	1	0.2	0.0%			0.0%		
White	57	65	11.5	86.2%	5.8%		72.3%	1.0%	
Grand Total	170	187	34.7	82.4%			71.7%		

Academic Year 2017-18

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Asian	2	2	0.4	100.0%			100.0%		
Black	7	7	1.2	71.4%			71.4%		
Filipino	6	6	0.7	83.3%			50.0%		
Hispanic	98	116	22.0	86.2%	-0.1%	1	74.1%	-0.4%	1
Native Am	3	3	0.5	100.0%			100.0%		
White	73	84	14.6	86.9%	1.1%		75.0%	1.1%	
Grand Total	189	218	39.5	86.2%			74.3%		

Academic Year 2018-19

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
Asian	2	2	0.4	50.0%			50.0%		
Black	4	4	0.9	100.0%			100.0%		
Filipino	7	7	1.5	100.0%			85.7%		
Hispanic	66	79	15.7	88.6%	4.7%		77.2%	-3.2%	3
Native Am	3	3	0.6	66.7%			33.3%		
Pac Isl	2	2	0.4	0.0%			0.0%		
White	64	69	12.9	85.5%	-1.1%	1	84.1%	8.8%	
Grand Total	148	166	32.4	86.1%			78.9%		

2c4: Equity — Geology and Physical Science: all courses, retention and success by student type

Academic Year 2013-14

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
First Time	13	13	2.2	92.3%	8.1%		84.6%	12.7%	
First Time Tran..	12	14	2.5	92.9%	8.7%		85.7%	13.9%	
Continuing	184	204	34.1	83.8%	-4.8%	10	72.1%	-2.9%	7
Returning	15	17	2.3	82.4%	-2.5%	1	58.8%	-14.8%	3
Grand Total	222	248	41.1	84.7%			72.6%		

Academic Year 2014-15

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
First Time	19	19	2.9	73.7%	-11.5%	3	47.4%	-24.2%	5
First Time Tran..	3	3	0.6	100.0%			100.0%		
Continuing	140	147	24.9	84.4%	2.0%		70.7%	9.0%	
Returning	10	10	2.1	90.0%	6.4%		70.0%	1.0%	
Special Admit	2	2	0.2	100.0%			100.0%		
Grand Total	174	181	30.7	84.0%			69.1%		

Academic Year 2015-16

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
First Time	14	14	2.1	85.7%	-3.6%	1	71.4%	-6.7%	1
First Time Tran..	10	12	2.5	91.7%	2.8%		75.0%	-2.8%	1
Continuing	147	157	29.1	88.5%	-2.9%	5	77.1%	-2.9%	5
Returning	8	9	1.6	100.0%			100.0%		
Grand Total	179	192	35.3	89.1%			77.6%		

Academic Year 2016-17

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
First Time	13	13	2.3	92.3%	10.7%		61.5%	-10.9%	2
First Time Tran..	9	11	1.9	81.8%			72.7%		
Continuing	140	152	28.3	80.9%	-7.7%	12	71.1%	-3.2%	5
Returning	7	9	1.8	88.9%			88.9%		
Special Admit	2	2	0.4	100.0%			100.0%		
Grand Total	170	187	34.7	82.4%			71.7%		

Academic Year 2017-18

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
First Time	11	12	2.1	83.3%	-3.1%	1	58.3%	-16.9%	3
First Time Tran..	3	3	0.5	33.3%			33.3%		
Continuing	164	192	35.1	87.5%	10.6%		76.0%	14.5%	
Returning	11	11	1.8	81.8%	-4.7%	1	72.7%	-1.7%	1
Grand Total	189	218	39.5	86.2%			74.3%		

Academic Year 2018-19

	Headcount	Enrollment	FTES	Retention %	PPG Retention Mod	PPG Retention Impact	Success %	PPG Success Mod	PPG Success Impact
First Time	12	12	2.2	75.0%	-12.0%	2	66.7%	-13.2%	2
First Time Tran..	7	7	1.5	85.7%			57.1%		
Continuing	120	137	26.8	86.9%	4.1%		80.3%	7.9%	
Returning	7	7	1.3	85.7%			85.7%		
Special Admit	3	3	0.6	100.0%			100.0%		
Grand Total	148	166	32.4	86.1%			78.9%		

2d: Efficiency — Geology and Physical Science: all courses offered during 2017-2018 and 2018-2019

5 Efficiency Table GEOL

Academic Year	Term Code_	course_	FTES	FTEF+	FTES / FTEF	Enrollment	Maximum Enrollment	MaxEnroll..	Fill Rate
2017-18	Fall 2017	GEOL100	9.3	0.776	12.0	44	56	28.0	79%
		GEOL141	2.3	0.200	11.4	22	28	28.0	79%
		PHSC111	6.1			29	28	28.0	104%
		PHSC199G	3.9			28	32	32.0	88%
		PHSC199H	0.1			1	0	0.0	
		Total	**21.8**	**0.976**	**22.3**	**124**	**144**	**24.0**	**86%**
	Spring 2018	GEOL100	10.2	0.776	13.1	48	56	28.0	86%
		GEOL114	1.2	0.260	4.8	16	28	28.0	57%
		PHSC112	6.3			30	28	28.0	107%
		Total	**17.7**	**1.036**	**17.1**	**94**	**112**	**28.0**	**84%**
	Total		**39.5**	**2.012**	**19.6**	**218**	**256**	**25.6**	**85%**
2018-19	Fall 2018	GEOL100	10.0	0.776	12.8	47	56	28.0	84%
		PHSC111	5.7			27	28	28.0	96%
		Total	**15.7**	**0.776**	**20.2**	**74**	**84**	**28.0**	**88%**
	Spring 2019	GEOL100	9.3	0.776	12.0	44	56	28.0	79%
		GEOL114	1.3	0.259	5.1	19	28	28.0	68%
		PHSC112	6.1			29	28	28.0	104%
		Total	**16.8**	**1.035**	**16.2**	**92**	**112**	**28.0**	**82%**
	Total		**32.4**	**1.811**	**17.9**	**166**	**196**	**28.0**	**85%**
Grand Total			**71.9**	**3.823**	**18.8**	**384**	**452**	**26.6**	**85%**

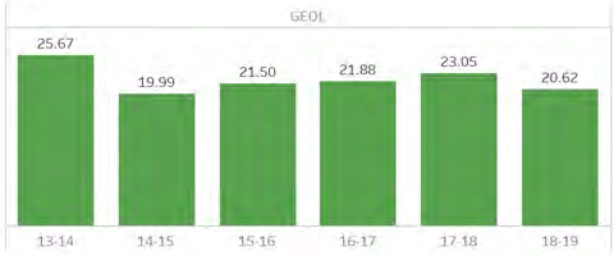
2e: Faculty Load and Faculty Type — Geology and Physical Science: 2013-2014 to 2018-2019

7 FTEF+Overload, FTES & Efficiency - GEOL

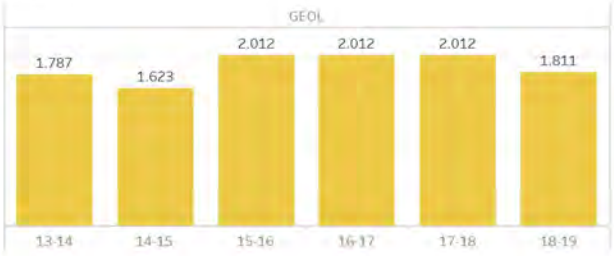
Academic Year

2013-2014			2014-2015			2015-2016			2016-2017			2017-2018			2018-2019		
FTEF+	FTES	FTES/ FTEF	FTEF+	FTES	FTES/ FTEF	FTEF+	FTES	FTES/ FTEF	FTEF+	FTES	FTES/ FTEF	FTEF+	FTES	FTES/ FTEF	FTEF+	FTES	FTES/ FTEF
1.787	25.67	14.37	1.623	19.99	12.31	2.012	21.50	10.69	2.012	21.88	10.88	2.012	23.05	11.45	1.811	20.62	11.39

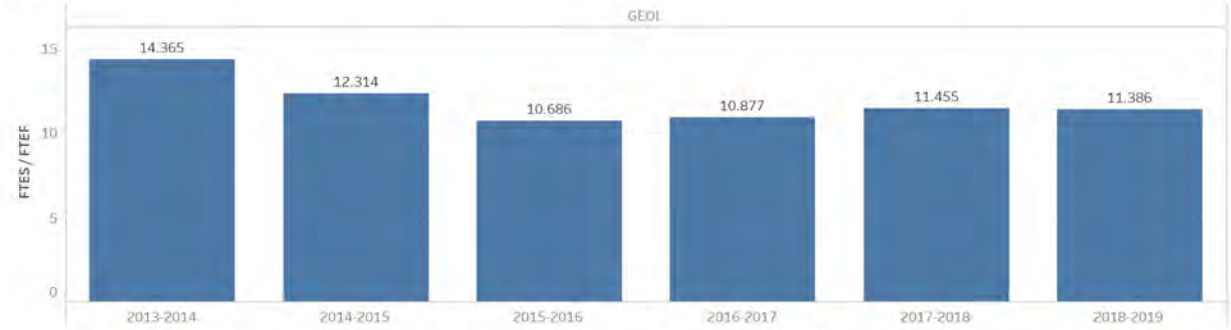
FTES



FTEF



FTEF/ FTES



7 FTEF, overload, sections by faculty type GEOL

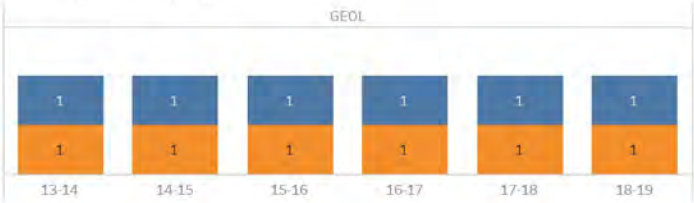
SUBJECT	Faculty Type	2013-2014 FTEF	2013-2014 Overload	2013-2014 Faculty	2013-2014 Sections	2014-2015 FTEF	2014-2015 Overload	2014-2015 Faculty	2014-2015 Sections	2015-2016 FTEF	2015-2016 Overload	2015-2016 Faculty	2015-2016 Sections
GEOL	Instructional - FT	1.328	0.000	1.000	4.000	1.423	0.000	1.000	4.000	1.388	0.164	1.000	4.000
	Instructional - PT	0.459	0.000	1.000	2.000	0.200	0.000	1.000	1.000	0.460	0.000	1.000	2.000
Grand Total		1.787	0.000	2.000	6.000	1.623	0.000	2.000	5.000	1.848	0.164	2.000	6.000

SUBJECT	Faculty Type	2016-2017 FTEF	2016-2017 Overload	2016-2017 Faculty	2016-2017 Sections	2017-2018 FTEF	2017-2018 Overload	2017-2018 Faculty	2017-2018 Sections	2018-2019 FTEF	2018-2019 Overload	2018-2019 Faculty	2018-2019 Sections
GEOL	Instructional - FT	1.164	0.388	1.000	4.000	1.224	0.328	1.000	4.000	1.224	0.328	1.000	4.000
	Instructional - PT	0.460	0.000	1.000	2.000	0.460	0.000	1.000	2.000	0.259	0.000	1.000	1.000
Grand Total		1.624	0.388	2.000	6.000	1.684	0.328	2.000	6.000	1.483	0.328	2.000	5.000

Faculty Type
Instructional - FT
Instructional - PT

%FTEF by Faculty Type

Faculty count by type



Overload

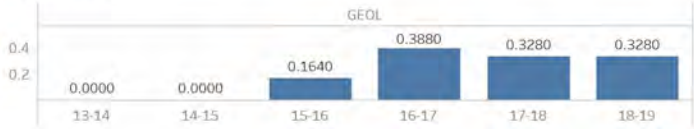


Table 1a: Physical Science PSLO Performance 2013-2019 - overall

7- SLO Performance by PSLO

PSLO	% From 70% Benchmark	% Meets and Exceeds Standards	% Exceeds Standards	Institutional Exceeds Standards Count	% Meets Standards	Institutional Meets Standards Count	% Below Standards	Institutional Below Standards Count
PHSC PSLO - Carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.	11.09%	81.09%	51.16%	224	29.94%	130	18.91%	46
PHSC PSLO - Describe the methods and standards of science and the fundamental principles that govern the universe.	-6.80%	63.20%	13.68%	35	49.53%	191	36.80%	192
PHSC PSLO - Give examples of processes which illustrate the application of a major scientific principle.	-16.25%	53.75%	26.34%	360	27.42%	372	46.25%	720
PHSC PSLO - Identify a variety of geological specimens (e.g., rocks, minerals, fossils) and interpret geologic data (rocks, maps, cross sections, etc.), both in terms of plate tectonic theory.	2.75%	72.75%	44.98%	1,080	27.76%	696	27.25%	816
PHSC PSLO - State the major scientific principles in both verbal and in simplified mathematical form.	-19.91%	50.09%	23.01%	528	27.09%	612	49.91%	1,392

Table 1b: Physical Science PSLO Performance 2013-2019 - demographic breakdown

8- SLO Performance by PSLO Demographic

PSLO	Demographic Category	Demographic Element (group)	% From 70% Benchmark	% Meets and Exceeds Standards	% Exceeds Standards	% Meets Standards	% Below Standards
PHSC PSLO - Carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.	Ethnicity	Hispanic	11.37%	81.37%	32.35%	49.02%	18.63%
		Other under-represented					
		White Non-Hispanic	10.00%	80.00%	62.86%	17.14%	20.00%
	Gender	Female	17.50%	87.50%	66.91%	20.59%	12.50%
		Male	-0.56%	69.44%	33.33%	36.11%	30.56%
PHSC PSLO - Describe the methods and standards of science and the fundamental principles that govern the universe.	Ethnicity	Hispanic	-24.29%	45.71%	14.29%	31.43%	54.29%
		Other under-represented	30.00%	100.00%	0.00%	100.00%	0.00%
		White Non-Hispanic	8.57%	78.57%	25.00%	53.57%	21.43%
	Gender	Female	-1.25%	68.75%	20.00%	48.75%	31.25%
		Male	-15.00%	55.00%	12.50%	42.50%	45.00%
PHSC PSLO - Give examples of processes which illustrate the application of a major scientific principle.	Ethnicity	Hispanic	-19.17%	50.83%	19.39%	31.44%	49.17%
		Other under-represented	-3.33%	66.67%	30.00%	36.67%	33.33%
		White Non-Hispanic	8.33%	78.33%	57.78%	20.56%	21.67%
	Gender	Female	-35.12%	34.88%	23.39%	11.50%	65.12%
		Male	4.26%	74.26%	39.54%	34.72%	25.74%
PHSC PSLO - Identify a variety of geological specimens (e.g., rocks, minerals, fossils) and interpret geologic data (rocks, maps, cross sections, etc.), both in terms of plate tectonic theory.	Ethnicity	Hispanic	-11.77%	58.23%	27.48%	30.75%	41.77%
		Other under-represented	30.00%	100.00%	65.00%	35.00%	0.00%
		White Non-Hispanic	24.05%	94.05%	65.29%	28.76%	5.95%
	Gender	Female	0.91%	70.91%	38.38%	32.53%	29.09%
		Male	6.44%	76.44%	46.70%	29.74%	23.56%
PHSC PSLO - State the major scientific principles in both verbal and in simplified mathematical form.	Ethnicity	Hispanic	-22.75%	47.25%	21.68%	25.57%	52.75%
		Other under-represented	-8.00%	62.00%	32.00%	30.00%	38.00%
		White Non-Hispanic	1.39%	71.39%	42.36%	29.03%	28.61%
	Gender	Female	-38.73%	31.27%	18.41%	12.86%	68.73%
		Male	0.83%	70.83%	35.28%	35.56%	29.17%

Table 2: Geology PSLO Performance 2016-2017 - Physical Geology

Overall by PSLO for Department: Geology

	Institutional Exceeds Standards		Institutional Meets Standards		Institutional Below Standards		Total Enrolled Students
GEOL PSLO 1: Apply the scientific method to solve geological problems.	0	0.00%	0	0.00%	0	0.00%	Includes sections w/o rosters
GEOL PSLO 2: Identify a variety of geological specimens (e.g., rocks, minerals, fossils).	45	28.12%	43	26.88%	72	45.00%	Includes sections w/o rosters
GEOL PSLO 3: Interpret geologic data (rocks, maps, cross sections, etc.) in terms of plate tectonic theory.	17	16.19%	58	55.24%	30	28.57%	Includes sections w/o rosters
GEOL PSLO 4: Identify the impacts of geological processes on society and vice versa.	0	0.00%	0	0.00%	0	0.00%	Includes sections w/o rosters
GEOL PSLO 5: Communicate effectively, in written and oral formats, the skills listed above.	7	23.33%	8	26.67%	15	50.00%	Includes sections w/o rosters

3. Articulation Status of Courses

The tables summarizing the articulation status of courses in the Geology/Physical Science program on pages 41-52 were provided by AHC's articulation officer on 6-Jul-2020.

4. Course Review Verification Sheet

The outline below lists the changes proposed to the approved course outlines and included in the new course outlines developed during this review process (Appendix A). Verification form follows.

GEOL 100: Physical Geology with lab

1. **Requisites** now include advisories for ENGL 101 (to support writing assignment) and MATH 311 (to ensure student familiarity with linear and exponential equations that are used to calculate plate motion rates, earthquake magnitudes, radiometric ages, map scales, etc.)
2. Revised **Course Description**.
3. How are course objectives and SLOs different? Revised **Course Objectives** and made same as **SLOs**. C-ID course outcomes are cited for comparison.
4. **Lecture Content** and **Lab Content** are taken from CID as in existing COR.
5. **Assignments** and **Methods of Evaluation** revised slightly.
6. **Adopted Textbook** changed to a more recent text.

GEOL 111: Historical Geology with lab

1. This is a new course for AHC.
2. **Requisites** now includes advisories for ENGL 101 and MATH 311 as in the updated GEOL 100 COR.
3. **Course Description** is the same as for *Historical Geology* (GEOL 1220) at College of the Siskiyous.
4. **Course Objectives** and **SLOs** are the same as one another and are from COS's GEOL 1220. C-ID course outcomes are cited for comparison..
5. **Lecture Content** and **Lab Content** are taken from GEOL 111 CID, as they were for GEOL 100.
6. **Assignments**, **Methods of Evaluation**, and **Adopted Textbook** are from COS's GEOL 1220.

GEOL 114: Oceanography

1. **Units and Hours** section lists a lab but the only reference to lab activities in the existing COR is field trips.
2. Revised **Course Description**.
3. How are course objectives and SLOs different? Revised **Course Objectives** and made same as **SLOs**. No C-ID course outcomes have been written for Oceanography.
4. **Lecture Content** taken from existing COR.
5. **Lab Content** only specified as "field trips".
6. **Assignments** and **Methods of Evaluation** revised slightly.
7. **Adopted Textbook** changed to a more recent text.

GEOL 131: Geology of California

1. **Requisites** now include advisory for MATH 311, consistent with other geology courses, so that students will be familiar with linear and exponential equations that are used to calculate plate motion rates, earthquake magnitudes, radiometric ages, etc.
2. Revised **Course Description**.
3. How are course objectives and SLOs different? Revised **Course Objectives** and made same as **SLOs**. C-ID course outcomes are cited for comparison.
4. **Lecture Content** taken from C-ID and existing COR.
5. **Assignments** and **Methods of Evaluation** revised slightly.
6. **Adopted Textbook** changed to a more recent text.

GEOL 141: Environmental Geology

1. Revised **Course Description**.
2. How are course objectives and SLOs different? Revised **Course Objectives** and made same as **SLOs**. C-ID course outcomes are cited for comparison.
3. **Lecture Content** taken from C-ID and existing COR and supplemented with details from COS GEOL 1110.
4. **Assignments** and **Methods of Evaluation** revised slightly.
5. **Adopted Textbook** changed to a slightly more recent text.

GEOL 189: Independent Projects in Geology

1. Minor revisions to wording and format but content is unchanged from existing COR.

GEOL 199A: Topics in Geology—California Deserts

1. Minor revisions to wording and format but content is unchanged from existing COR.
2. Added four **Student Learning Outcomes** appropriate to the content of the course.

GEOL 199B: Topics in Geology—California Coast

1. Minor revisions to wording and format but content is unchanged from existing COR.
2. Added four **Student Learning Outcomes** appropriate to the content of the course.

GEOL 199C: Topics in Geology—Sierra Nevada

1. Minor revisions to wording and format but content is unchanged from existing COR.
2. Added four **Student Learning Outcomes** appropriate to the content of the course.

GEOL 199D: Topics in Geology—California Transect

1. Modified **Units and Hours** by transferring 0.380 units (6.0-6.5 hours) from lab to lecture to match other GEOL 199 courses.
2. Minor revisions to wording and format but content, including SLOs, is unchanged from existing COR.

PHSC 111: Matter, energy, and molecules

1. Minor revisions to wording and format but content, including SLOs, is unchanged from existing COR.

PHSC 112: Earth and the Universe

1. Minor revisions to wording and format but most content, including SLOs, is unchanged from existing COR.
2. Lecture and Lab Content were identical in the original COR so **Lab Content** has been updated to activities appropriate to the Lecture Content.

PHSC 199A: Colorado Plateau

1. No changes to the COR for this course.

PHSC 199B: Colorado Plateau – Advanced Studies

1. No changes made to the COR for this course at this time.

PHSC 199C: National Parks

1. No changes made to the COR for this course at this time.

PHSC 199D: National Parks – Advanced Studies

1. No changes made to the COR for this course at this time.

PHSC 199E: Death Valley

1. No changes made to the COR for this course at this time.

PHSC 199F: Death Valley – Advanced Studies

1. No changes made to the COR for this course at this time.

PHSC 199G: Eastern Sierra Nevada

1. No changes made to the COR for this course at this time.

PHSC 199H: Eastern Sierra Nevada – Advanced Studies

1. No changes made to the COR for this course at this time.

COURSE REVIEW VERIFICATION

Discipline: Geology and Physical Science Year: 2020

Course outlines were not reviewed prior to the writing of the program review but are suggested in it (below) and will be done during the 2020-2021 academic year. The program review author recommends that:

1. The following course outlines are satisfactory as written and do not require modification (list all such courses):

   PHSC 199A, PHSC 199B, PHSC 199C, PHSC 199D, PHSC 199E, PHSC 199F, PHSC 199G, PHSC 199H

2. The following courses require minor modification to ensure currency. The self-study team anticipates submitting such modifications to the AP&P committee, FALL 2020 or SPRING 2021:

   GEOL 189, PHSC 111, and PHSC 112

3. The following courses require major modification. The self-study team anticipates submitting such modifications to the AP&P committee, FALL 2020 or SPRING 2021:

   GEOL 100, GEOL 114, GEOL 131, GEOL 141, GEOL 199A, GEOL 199B, GEOL 199C, and GEOL 199D

GRADUATION REQUIREMENTS: General Education (GE), Multicultural/Gender Studies (MCGS) and Health & Safety (H&W) Courses.

The following courses were reviewed as meeting an **AHC GE** requirement. The AP&P GE Criteria and Category Definitions (GE Learning Outcomes) forms were submitted to the AP&P for review on: _____

GEOL 100, GEOL 114, GEOL 131, GEOL 141, PHSC 111, and PHSC 112

The following courses were reviewed as meeting the **MCGS** requirement. The AP&P MCGS Criteria and Category Definitions (MCGS Learning Outcomes – To Be Developed) forms were submitted to the AP&P for review on: _____

none

The following courses were reviewed as meeting the **H&W** requirement. The AP&P H&W Studies Criteria (To Be Developed) and Category Definitions (H&W Learning Outcomes – To Be Developed) forms were submitted to the AP&P chair for review on: _____

none

Course Review Team Members:

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
AP&P Chair	Signature	Date
Academic Dean	Signature	Date

GEOL 100 Physical Geology (3) **7/03/20**

CATALOG DESCRIPTION

An elementary course in the principles of physical geology including identification of rocks and minerals, study and interpretation of topographic and geological maps, and the study of land forms and structures. Includes a local field trip.

AHC Special Notes	Articulation Institution	Prefix	Title
	Cal Poly Pomona	GSC 1110 + GSC 1410L	Principles of Geology Principles of Geology Lab
	Cal Poly San Luis Obispo	GEOL 201 Or GEOL 201 And GEOL 241	Physical Geology Or Physical Geology And Physical Geology Lab
	CSU Bakersfield	GEOL 1009 or GEOL 2030	How the Earth Works (3) or Physical Geology (4)
	CSU Channel Islands	GEOL 121	Physical Geology
	CSU Chico	GEOS 102	Physical Geology
	CSU Dominguez Hills	EAR 100 And EAR 101	Physical Geology And Physical Geology Lab
	CSU East Bay	GEOL 2101	Physical Geology (5)
	CSU Fresno	EES 1	Natural Disasters & Earth Resource (4)
	CSU Fullerton	GEOL 101 GEOL 101L	Physical Geology Physical Geology Lab
	CSU Long Beach	GEOL 102 GEOL 104	General Geology General Geology/Lab
	CSU Los Angeles	GEOL 1500	Earth Revealed (3)
	CSU Monterey Bay	GEOL 260	Geology & Hydrology (4)
	CSU Northridge	GEOL 101 & GEOL 102	Geology of Planet Earth (3) & Geology of Planet Earth Lab (1)
	CSU Sacramento	- - - - - - - - - - - - - - - - - - -	GEOL 10/10L, Physical Geology (3)/Lab (1)
	CSU San Bernardino	GEOL 101	Introductory Geology (5)
	CSU San Marcos	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Stanislaus	- - - - - - - - - - - - - - - - - - -	GEOL 2100/2102, Principles of Geology (3)/Lab (1)
	Humboldt State	GEOL 109	General Geology (4)
	San Diego State	GEOL 100 & GEOL 101	Planet Earth Dynamics of the Earth Lab
	San Francisco State	GEOL 110	Physical Geology (4)
	San Jose State	GEOL 1	GEOL 1, General Geology (3)

	Sonoma State	GEOL 102	Our Dynamic Earth: An Introduction to Geology (3)
	UC List	Yes	
	UC Berkeley	EPS 50	The Planet Earth (4)
	UC Davis	GEOLOGY 1 or GEOLOGY 50/50L	The Earth (4) or Physical Geology (3)/Lab (2)
	UC Irvine	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Los Angeles	E&S SCI 1	Introduction to Earth Science (5)
	UC Merced	Physical Geology w/ lab	One semester credit
	UC Riverside	GEO 1	The Earth's Crust and Interior (4)
Same As - GEOL 141 Or ENV ST 102	UC San Diego	SIO 10	The Earth (4)
	UC Santa Barbara	EARTH 2	Principles of Physical Geology (4)
	UC Santa Cruz	EART 10/10L	Geological Principles (5)/Lab (1)
	C-ID	GEOL 101	Physical Geology with Lab
	CSU GE	B1/B3	
	IGETC	5A	

GEOL 114 Oceanography (3.5) **7/03/20**

CATALOG DESCRIPTION

An introduction to the physical and biological aspects of the marine environment, including processes of heat transfer, tides, currents, waves, life in the marine ecosystem, geological processes of shorelines, deep-sea geology, plate tectonics, and marine economic resources. Includes field trips to local Coastal areas.

AHC Special Notes	Articulation Institution	Prefix	Title
	Cal Poly Pomona	GSC 1200	Introduction to Oceanography (4)
	Cal Poly San Luis Obispo	PSC 201	Introduction to Physical Oceanography
	CSU Bakersfield	- - - - - - - - - - - - - - - - - - -	GEOL 2030, Intro to Oceanography (4)
	CSU Channel Islands	- - - - - - - - - - - - - - - - - - -	ESRM 210, Physical Oceanography (4)
	CSU Chico	- - - - - - - - - - - - - - - - - - -	GEOS 110, Oceanography (3)
	CSU Dominguez Hills	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [EAR 370, Oceanography (3)
	CSU East Bay	- - - - - - - - - - - - - - - - - - -	GEOL 120, Intro to Oceanography (3)
	CSU Fresno	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Fullerton	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEAL 333, General Oceanography (4)
	CSU Long Beach	GEOL 160	Introduction to Oceanography
	CSU Los Angeles	GEOL 155	Oceanography (3)
	CSU Monterey Bay	MSCI 270	The Oceans
	CSU Northridge	GEOL 122	The World Ocean (3)
	CSU Sacramento	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 130, Oceanography (3)]
	CSU San Bernardino	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU San Marcos	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Stanislaus	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	Humboldt State	- - - - - - - - - - - - - - - - - - -	OCN 109/109L, General Oceanography (3)/Lab (1)
	San Diego State	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	San Francisco State	- - - - - - - - - - - - - - - - - - -	OCN 100/101L, General Oceanography (3)/Lab (1)
	San Jose State	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	Sonoma State	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Transferable	Yes	
	UC Berkeley	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Davis	GEOLOGY 16 and GEOLOGY 16G	The Oceans (3) and The Oceans: Discussion(2)
	UC Irvine	- - - - - - - - - - - - - - - - - - -	Not Major Prep

			EARTHSS 3, Oceanography (4)
	UC Los Angeles	- - - - - - - - - - - - - - - - - - -	EPS SCI 15, Blue Planet: Intro to Oceanography (5)
	UC Merced	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Riverside	GEO 9	Oceanography (4)
	UC San Diego	SIO 30	The Oceans (4)
	UC Santa Barbara	EARTH 4	Introduction to Oceanography (4)
	UC Santa Cruz	- - - - - - - - - - - - - - - - - - -	EART 1, Oceanography (5)
	C-ID	N/A	
	CSU GE	B1	
	IGETC	5A	

GEOL 131 Geology of California (3) **07/03/20**

CATALOG DESCRIPTION

An overview of the geologic features and history of California emphasizing an understanding of California's past and present plate tectonic setting, unique landscape features, resources and hazards.

AHC Special Notes	Articulation Institution	Prefix	Title
	Cal Poly Pomona	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	Cal Poly San Luis Obispo	GEOL 204	Geological History of California
	CSU Bakersfield	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Channel Islands	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 310, California Geology (3)]
	CSU Chico	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOS 325, Geology of California (3)]
	CSU Dominguez Hills	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU East Bay	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Fresno	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [EES 168, California's Earth System (3)]
	CSU Fullerton	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 310T, Topics in CA-Related Geology (1-3)]
	CSU Long Beach	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Los Angeles	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 411, Geotectonic Development of CA (4)]
	CSU Monterey Bay	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Northridge	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 345, Geology of California (2)]
	CSU Sacramento	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEO 121, Geology of California (3)]
	CSU San Bernardino	- - - - - - - - - - - - - - - - - - -	GEOL 2500, Geology of California (3)
	CSU San Marcos	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Stanislaus	- - - - - - - - - - - - - - - - - - -	GEOL 2000, California Geology (3)
	Humboldt State	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent GEOL 300, Geology of California (3)]
	San Diego State	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	San Francisco State	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 356, Geology of California (3)]
	San Jose State	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	Sonoma State	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC List	Yes	
	UC Berkeley	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Davis	GEOLOGY 20	California Geology (2)

	UC Irvine	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Los Angeles	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Merced	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Riverside	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC San Diego	- - - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Santa Barbara	- - - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 109, Geology of California (4)]
	UC Santa Cruz	EART 5 (EART 5L)	California Geology (California Geology Lab) - **No lab component articulated**
	C-ID	GEOL 200	Geology of California
	CSU GE	B1	
	IGETC	5A	

GEOL 141 Environmental Geology (3) **7/03/20**

CATALOG DESCRIPTION

A study of humankind's scientific, social, and ethical interactions with earth systems. Topics include earth processes, geologic hazards, the earth's renewable and non-renewable resources, and the earth's ability to accept the products of human waste. This course is not open to students who are enrolled in or have received credit for Environmental Studies 102.

AHC Special Notes	Articulation Institution	Prefix	Title
	Cal Poly Pomona	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	Cal Poly San Luis Obispo	GEOL 102	Introduction to Geology
	CSU Bakersfield	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Channel Islands	- - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEO 321, Environmental Geology (4)]
	CSU Chico	- - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOS 340, Environmental Geology (3)]
	CSU Dominguez Hills	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU East Bay	ENSC/GEOL 2210	Environmental Geology (4)
	CSU Fresno	EES 4	Environmental Science (4)
	CSU Fullerton	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Long Beach	GEOL 190	Environmental Geology (3)
	CSU Los Angeles	GEOL1580	Natural Disasters (3)
	CSU Monterey Bay	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Northridge	- - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 300, Environmental Geology (3)]
	CSU Sacramento	- - - - - - - - - - - - - - - - - -	GEOL 7, Natural Disasters (3)
	CSU San Bernardino	- - - - - - - - - - - - - - - - - -	GEOL 1060, Environmental Geology and Geological Hazards (3)
	CSU San Marcos	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Stanislaus	- - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 3050, Environmental Geology (4)]
	Humboldt State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	San Diego State	**Articulation Denied**	[ENV S 100, Environmental Science]
	San Francisco State	ERTH 230	Environmental Geology (3)
	San Jose State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	Sonoma State	- - - - - - - - - - - - - - - - - -	Upper Division Equivalent [GEOL 306, Environmental Geology (3)]
	UC Transferable	Yes	
	UC Berkeley	- - - - - - - - - - - - - - - - - -	EPS 80, Environmental Earth Sciences (2)
	UC Davis	GEOLOGY 10	Global Environmental Change (3)
	UC Irvine	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Los Angeles	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Merced	- - - - - - - - - - - - - - - - - -	No Equivalent Course

	UC Riverside	GEO 4	Natural Hazards and Disasters
	UC San Diego	ERTH 10	The Earth
	UC Santa Barbara	ENV S 2	Introduction to Environmental Studies
	UC Santa Cruz	EART 20 (EART 20L)	Environmental Geology (Environmental Geology Lab) - **No lab component articulated**
	C-ID	GEOL 130	Environmental Geology
	CSU GE	B1	
	IGETC	5A	

PHSC 111 Matter, Energy, and Molecules (4) **7/03/20**

CATALOG DESCRIPTION

Introduction to the basic principles of physical science and applications of these principles in everyday life. Measurement, force and motion, work and energy, heat, waves, electricity, atomic physics, compounds, molecules, and ions will be explored.

AHC Special	Articulation Institution	Prefix	Title
	Cal Poly Pomona	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	Cal Poly San Luis Obispo	PSC 101 Or PSC 102	Physical Environment: Matter & Energy Or Physical Environment: Atoms & Molecules
	CSU Bakersfield	- - - - - - - - - - - - - - - - - - - -	SCI 1100, Intro to Chemistry for Liberal Studies (2)
	CSU Channel Islands	PHSC 170	Foundations in Physical Science
	CSU Chico	GEOS/SCED 141	Concepts in Physical Science (3)
	CSU Dominguez Hills	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU East Bay	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Fresno	NSCI 1A	Integrated Science: Physics and Chemistry (4)
	CSU Fullerton	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Long Beach	PHSC 112	Introduction to Physical Sciences (3)
	CSU Los Angeles	- - - - - - - - - - - - - - - - - -	NATS 1010, Physical Science (4)
	CSU Monterey Bay	PHYS 121/121L	Integrated Physical Science (3)/Lab (1)
	CSU Northridge	PHSC 170	Introduction to Physical Science (4)
	CSU Sacramento	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU San Bernardino	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU San Marcos	- - - - - - - - - - - - - - - - - -	GES 105, Introduction to Physical Science (3)
	CSU Stanislaus	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	Humboldt State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
+ PHSC 112	San Diego State	N SCI 100 Or - - - - - - - - - - - - - - - - - -	Physical Science Or Articulation Denied [GEOL 104, Earth Science)
	San Francisco State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	San Jose State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	Sonoma State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Transferable	Yes	
	UC Berkeley	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Davis	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Irvine	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Los Angeles	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Merced	- - - - - - - - - - - - - - - - - -	ESS 1, Intro to Earth Systems Science (4)

	UC Riverside	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC San Diego	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Santa Barbara	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Santa Cruz	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	C-ID	CHEM 140	Survey of Chemistry and Physics
	CSU GE	B1	
	IGETC	5A	

PHSC 112 Earth and the Universe (4) **7/03/20**

CATALOG DESCRIPTION

Introduction to the basic principles of astronomy and earth sciences and applications of these principles to everyday life. Topics include the solar system, stars, galaxies, and cosmology. Structure and formation of the earth, earthquakes, plate tectonics, the atmosphere, and weather.

AHC Special Notes	Articulation Institution	Prefix	Title
	Cal Poly Pomona	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	Cal Poly San Luis Obispo	PSC 103	Physical Environment: Earth & Universe
	CSU Bakersfield	GEOL 1009	How the Earth Works (3)
	CSU Channel Islands	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Chico	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU Dominguez Hills	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU East Bay	**Pending**	**Requested 3/25/14 [GEOL1001, Intro to the Earth Sciences (4) & GEOL 1002, Earth Sciences Lab (1)]**
	CSU Fresno	EES 9	Introduction to Earth Science (3)
	CSU Fullerton	GEOL 102	Earth/Astro Science Elementary Teacher (3)
	CSU Long Beach	PHSC 111	Introduction to the Physical Sciences (3)
	CSU Los Angeles	- - - - - - - - - - - - - - - - - -	NATS 1020, Earth and Space Science (4)
	CSU Monterey Bay	GEOL 210	Intro to Earth Science (3)
Or ASTRON 100	CSU Northridge	GEOL 106LRS Same as: GEOG 106LRS	Earth and Space Science for Liberal Studies Majors (3)
	CSU Sacramento	- - - - - - - - - - - - - - - - - -	GEOL 8/8L, Earth Science (3)/Lab (1)
	CSU San Bernardino	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	CSU San Marcos	ES 100	The Earth and its Place in the Universe (3)
	CSU Stanislaus	- - - - - - - - - - - - - - - - - -	GEOL 2400, Introduction to Earth Science (3)
	Humboldt State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
+ PHSC 111	San Diego State	- - - - - - - - - - - - - - - - - -	Articulation Denied [GEOL 104, Earth Science]
	San Francisco State	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	San Jose State	- - - - - - - - - - - - - - - - - -	GEOL 2, Intro to Earth Science (3)
	Sonoma State	GEOL 107	Introduction to Earth Science (3)
	UC Transferable	Yes	
	UC Berkeley	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Davis	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Irvine	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Los Angeles	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Merced	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Riverside	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC San Diego	SIO 12	History of the Earth and Evolution (4)

	UC Santa Barbara	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	UC Santa Cruz	- - - - - - - - - - - - - - - - - -	No Equivalent Course
	C-ID	GEOL 121	Earth Science with Lab
	CSU GE	B1	
	IGETC	5A	

5. Approved Course Outlines

The course outlines included on pages 55-131 of this report are the existing, approved course outlines for Geology/Physical Science courses.

6. Review of Prerequisites, Co-requisites and Advisories

The table below lists the existing requisites for each Geology and Physical Science course, any changes to these requisites proposed as part of the new course outlines (Appendix A), and the rationale for each of these proposed changes.

Course	Existing Requisite	Proposed Requisite	Rationale for change
GEOL 100: Physical Geology with lab	none	Advisories: ENGL 101 and MATH 311	ENGL 101: support for writing assignment; MATH 311: familiarity with linear and exponential equations used to calculate plate motion rates, radiometric ages, map scales, etc.
GEOL 111: Historical Geology with lab	<new course>	Advisories: ENGL 101 and MATH 311	ENGL 101: support for writing assignment; MATH 311: familiarity with linear and exponential equations used to calculate plate motion rates, radiometric ages, map scales, etc.
GEOL 114: Oceanography	Advisories: ENGL 101 and MATH 311	No change	--
GEOL 131: Geology of California	Advisory: ENGL 101	Advisories: ENGL 101 and MATH 311	MATH 311: familiarity with linear and exponential equations used to calculate plate motion rates, radiometric ages, earthquake magnitudes, etc.
GEOL 141: Environmental Geology	Advisories: ENGL 101 and MATH 311	No change	--
GEOL 189: Independent Projects	none	No change	--
GEOL 199A: Geology of the California Desert	none	No change	--

GEOL 199B: Geology of the California Coast	none	No change	--
GEOL 199C: Geology of the Sierra Nevada	none	No change	--
GEOL 199D: Geology Transect of California	none	No change	--
PHSC 111: Energy, Matter, and Molecules	Advisories: ENGL 101 and MATH 311	No change	--
PHSC 112: Earth and Universe	Advisories: ENGL 101 and MATH 311	No change	--
PHSC 199A: Colorado Plateau	None	No change	--
PHSC 199B: Colorado Plateau – Advanced Studies	None	No change	--
PHSC 199C: National Parks	None	No change	--
PHSC 199D: National Parks – Advanced Studies	None	No change	--
PHSC 199E: Death Valley	None	No change	--
PHSC 199F: Death Valley – Advanced Studies	None	No change	--
PHSC 199G: Eastern Sierra Nevada	None	No change	--
PHSC 199H: Eastern Sierra Nevada – Advanced Studies	None	No change	--

7. **Degree Requirements**
   The Geology/Physical Science program does not currently offer a degree. A proposal for an AS-T degree in Geology modified from an existing version of the Transfer Model Curriculum provided by the Articulation Officer is included, however, in Appendix B. In addition, a Guided Pathways schedule for the proposed Geology degree is included in Appendix C

8. **Advisory Committee Membership**
   N/A because Geology/Physical Science is not a CTE discipline.

Board Approval:
PCA Established:
DL Conversion:
Date Reviewed: Fall 2014
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 100
Catalog Course Title: Physical Geology
Banner Course Title: Physical Geology

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	4.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

None

Entrance Skills

None

Catalog Description

An elementary course in the principles of physical geology including identification of rocks and minerals, study and interpretation of topographic and geological maps, and the study of land forms and structures. Includes a local field trip.

Course Content

Lecture

Lecture Content:

Introduction to Geology

- The Scientific Metho
- History of Geology

Earth Materials

- Minerals
- Igneous, Sedimentary and Metamorphic Rocks
- Soils

Geologic Time and Earth History

- Geologic Time
- Relative and Absolute Dating
- Fossils and Fossilization

Earth’s Internal Forces

- Plate Tectonics
- Earthquakes
- Volcanism and Igneous Rocks
- Mountain Building
- Geological Structures
- Metamorphism and Metamorphic Rocks

Earth's External Processes

- Weathering, Mass Wasting and Erosion
- Sediment and Sedimentary Rocks
- Surface Water Processes
- Groundwater Processes
- Oceans and Coastal Processes
- Desert Processes
- Glacial Processes

Earth Resources

- Renewable and Non-Renewable Resources
- Metallogenic Provinces

Laboratory Topics and Activities:

- Topographic maps
- Rock and Mineral identification
- Relative and absolute dating, geologic time
- Plate Tectonics
- Earthquakes
- Volcanoes
- Geological maps and cross sections, geological structures
- Surface and ground water processes
- Coastal processes
- Desert processes

- Glacial processes
- Field Trips

Course Objectives

At the end of the course, the student will be able to:

1. Describe basic principles and theories of geology (including plate tectonics) and apply them to decision making.
2. Identify common rocks, minerals, and fossils listed in popular lab manuals.
3. Interpret and use topographic and geologic maps in making decisions.
4. Identify local geologic features and describe their origin.
5. Read and understand articles pertaining to geology in popular newspapers, magazines, and journals.
6. Identify common landforms and describe their origin.
7. Describe basic geologic processes such as erosion, volcanism, plate tectonics, folding, faulting, and mountain building.
8. Describe in an elementary way how rocks are dated and how geologic time is subdivided.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**
- **Observation**
- **Visiting Lecturers**

Assignments

- **Other Assignments**
  10-15 Homework questions per week correlated with reading assignments and lectures.

  Samples:
  1. Analyze how the Hawaiian-Emperor chain of volcanoes are generated by the motion of the Pacific Plate over a fixed mantle Hot Spot (Plume).
  2. A jetty is constructed eastward into the ocean along a north-south trending shoreline. Longshore drift along the shoreline is from north to south. What response is expected above and below the jetty?
  3. A dam is to be constructed across Hot Springs Creek just outside the park boundary with the top of the dam at an elevation of 5500 feet. Using the topographic map calculate how long and wide the lake would be that would just spill over the top of the dam.
  (Associated laboratory course also provides additional correlated exercises.)

Methods of Evaluation

- **Exams/Tests**
- **Quizzes**
- **Field Trips**
- **Class Work**
- **Home Work**
- **Lab Activities**
- **Other**
  Achievement of objectives is demonstrated by means of written exams and quizzes whose questions and directives require observation, recall of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

Samples:
1. From Dinosaur Cave, look southeast and find the small hill on the cliff edge. What is this hill and how did it form geologically?
2. Since rivers carry more calcium than sodium to the sea, why is the sea "salty" with sodium rather than calcium?
3. Explain why there is such a wide variety of igneous rocks on Earth.
Grades: may be comparative (scaled or curve) or based on an absolute standard.

Texts and Other Instructional Materials

Adopted Textbook

1. Lutgens & Tarbuck *Essentials of Geology* Edition: 11th 2013

Supplemental Texts

1. Rocks, minerals, fossils, maps and other equipment to run the labs.

Instructional Materials
None

Student Learning Outcomes

1. GEOL100 SLO1 - Use geologic principles, theories, data, and tools to make decisions and solve problems.
2. GEOL100 SLO2 - Accurately describe and illustrate the various internal (e.g. plate tectonics, earthquakes, volcanoes, etc.) and external (e.g. streams, groundwater, glaciers, etc.) Earth processes.
3. GEOL100 SLO3 - Identify a variety of rocks and minerals and explain their formation in terms of plate tectonic theory.
4. GEOL100 SLO4 - Identify local geologic features and describe the geologic processes responsible for their formation.
5. GEOL100 SLO5 - Extract and use information from topographic maps, geologic maps, cross sections, stratigraphic columns, and aerial photographs.
6. GEOL100 SLO6 - Compare and contrast the various methods of dating geologic materials and integrate knowledge of rock-forming processes with geologic dating methods to summarize the geologic history of a region.

Distance Learning

This course is not Distance Learning.

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Board Approval:
PCA Established:
DL Conversion:
Date Reviewed: Fall 2015
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 114
Catalog Course Title: Oceanography
Banner Course Title: Oceanography

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	1.000	16.0 - 18.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	4.0	64.0 - 72.0	3.0
Total Contact Hours	4.0	64.0 - 72.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisories
ENGL 101 Freshman Composition: Exposition
and

Advisories
MATH 311 Algebra 1

Entrance Skills

Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.

- improve writing skills and techniques.
- effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- conduct research effectively including investigation, collection, evaluation, and documentation, and present the findings in acceptable written form.
- access and use information ethically and effectively.
- identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- state, use and identify the basic real number axioms.
- evaluate and simplify variable expressions.
- solve linear equations in one variable.
- solve and graph solutions to linear inequalities in one variable.
- graph linear equations in two variables using slope and intercept methods.
- add, subtract, multiply and divide polynomials.
- factor polynomials
- use factoring to simplify, multiple, and divided rational expressions.
- use factoring to solve quadratic equations.
- solve word problems at the elementary algebra level.
- evaluate and simplify expressions involving square roots

Catalog Description

An introduction to the physical and biological aspects of the marine environment, including processes of heat transfer, tides, currents, waves, life in the marine ecosystem, geological processes of shorelines, deep sea geology, plate tectonics, and marine economic resources. Includes field trips to local Coastal areas.

Course Content

Lecture

1. Introduction, Maps, Scientific Method, and History of Oceanography
2. Chemical and Physical Properties of Seawater
    a. chemistry of water
    b. salinity and dissolved gases
    c. sofar channel and shadow zone
3. Marine Meteorology
    a. atmosphere and circulation
    b. fronts, cyclones, and anticyclones
    c. coriolis Force
    d. sea ice and icebergs
4. Water Masses and Ocean Currents
    a. coriolis and eckman transport
    b. upwelling and downwelling

c. major ocean currents (gyres, gulfstream, etc.)

d. thermohaline circulation

e. tidal currents, storm surges, seiches

5. Estuaries

6. Waves and Tides

a. orbital motion

b. reflection, refraction, diffraction

c. breakers

d. seismic sea waves

e. tides

7. Beaches

a. longshore transport

b. shoreline erosion and deposition

8. Origin and Nature of the Earth

a. origin of the earth and oceans

b. earth materials and the rock cycle

c. earth's interior structure

d. geomagnetism

9. The Ocean Bottom

a. shelf, slope, and rise

b. ridges and features of specific oceans

c. atoll formation

d. submarine canyons

10. Plate Tectonics and Continental Drift Theory

a. paleomagnetism

b. earthquakes and plate boundaries

c. plate motions past and present

11. Marine Sediments

a. sediment sources

b. terrigenous, and pelagic sediments

c. phosphorites, evaporites, and manganese

12. The Marine Ecosystem and Marine Life

a. photosynthesis and respiration

b. nutrients and upwelling

c. productivity factors

d. plankton, nekton, and benthonics

Course Objectives

At the end of the course, the student will be able to:

1. synthesize their understanding of marine interrelationships by responding to exam questions.
2. identify common shoreline geologic features and analyze how they form by responding to exam questions.
3. identify organisms common to the marine environment.
4. synthesize their understanding of geologic processes occurring in or near the ocean by responding to exam questions.
5. evaluate how best to explore for and use marine resources by identifying potential resources (both physical and biological) and describing how best to use them without harming the ocean.
6. answer questions and solve problems on the field trips to local tidepools and shoreline areas.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Other Assignments**
  10-15 homework questions per week correlated with reading assignments and lectures.

  Samples:
  1. Analyze how evaporation and precipitation eventually lead to ocean circulation.
  2. Analyze the developmental stages of the following coastal features: baymouth bar, spit, sea stack, sea
  arch, sea caves, and headlands.

  (The field trips provide additional correlated exercises.)

Methods of Evaluation

- **Exams/Tests**

- **Quizzes**
- **Field Trips**
- **Home Work**
- **Other**

  Achievement of objectives is demonstrated by means of written exams whose questions and directives require observation, recall of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

  Samples:
  1. Analyze the method used by Erothosthenes to calculate the size of the Earth.
  2. Apply the origin of magnetic stripes on the ocean floor to synthesize the salient details of the Sea Floor spreading Process.

Texts and Other Instructional Materials

Adopted Textbook

1. Trujillo & Thurman *Essentials of Oceanography* Edition: 11 2014

Supplemental Texts

1. Northern California Tidepools: A guide to intertidal plants and animals from Oregon to the Central Coast.

Instructional Materials

None

Student Learning Outcomes

1. GEOL114 SLO1 - Illustrate earth and marine systems and their relationship to environmental issues.
2. GEOL114 SLO2 - Illustrate the interrelationships between marine and atmospheric environments.
3. GEOL114 SLO3 - Identify local coastal features and describe the marine processes responsible for their formation.
4. GEOL114 SLO4 - Evaluate how best to explore for and use marine resources by identifying potential physical, chemical, and biological resources and investigate how best to use them without harming the ocean.
5. GEOL114 SLO5 - Identify organisms common to the coastal marine environment.

Distance Learning

This course is not Distance Learning.

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Board Approval: 05/16/2000
PCA Established: 01/29/2015
DL Conversion:
Date Reviewed: Spring 2015
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 131
Catalog Course Title: Geology Of California
Banner Course Title: Geology Of California

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	0.000	0.0 - 0.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	3.0	48.0 - 54.0	3.0
Total Contact Hours	3.0	48.0 - 54.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisories
ENGL 101 Freshman Composition: Exposition

Entrance Skills

Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.
- improve writing skills and techniques.
- effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- conduct research effectively including investigation, collection, evaluation, and documentation, and present the findings in acceptable written form.

- access and use information ethically and effectively.
- identify both discipline specific and other information technology resources.

Catalog Description

An overview of the geologic features and history of California emphasizing an understanding of California's past and present plate tectonic setting, unique landscape features, resources and hazards.

Course Content

Lecture

1. Introduction; California's rich geographic/geologic diversity; This dynamic planet I
2. This dynamic planet II: plate boundaries and the footprints of past plate boundaries
3. An inventory of earth materials: minerals and rocks
4. Analytical tools: fossils, geologic dating, geologic principles
5. More analytical tools: geologic principles and geologic map interpretation
6. Volcanoes and volcanic hazards: the Cascade Range and the Modoc Plateau
7. The plate tectonic evolution of California through geologic time
8. The Pre-Cambrian and Paleozoic history of California (Basin and Range, Mojave, Klamath and Sierra Nevada regions)
9. The Mesozoic to Cenozoic history of California (Klamath, Sierra Nevada, Coast Ranges, Peninsular Ranges and Central Valley)
10. The Cenozoic history of California (Salton Trough, Peninsula Ranges, San Andreas Fault)
11. Assessing and analyzing earthquakes: living with uncertainty
12. Our local geologic provinces: the Cenozoic Traverse and Coast Ranges
13. California's modern basin and ranges and the modern Sierra Nevada
14. An analysis of California resources and their benefits to society
15. Geologic hazards and society: an appraisal of how well we are living with earth systems

Course Objectives

At the end of the course, the student will be able to:

1. interpret earth materials, structures, and other geologic relationships to analyze aspects of California's geologic and plate tectonic history.
2. read and interpret geologic cross sections and maps.
3. analyze geologic hazards and interpret their relationship to California's past and present geologic history.

Methods of Instruction

- **Demonstration**
- **Lecture**
- **Visiting Lecturers**

Assignments

- **Other Assignments**
  Homework exercises in:
  1. plate tectonic boundary interpretation
  2. structural geology interpretation
  3. interpretation of the geologic map of California

Methods of Evaluation

- **Exams/Tests**
- **Quizzes**
- **Class Work**
- **Home Work**
- **Other**
  Example Essay Questions:
  1) Compare and contrast the geology for each of the provinces or features listed below. BE CONCISE! Your answer should consider:
  - the important geologic characteristics of each area,
  - how the region or feature fits into the overall plate tectonic “picture” for California, and how the region or feature fits into the overall geologic history of California

  1. Cascade Region
  2. Modoc Plateau
  3. Klamath Mountains
  4. Sierra Nevada Province
  5. Coast Ranges
  6. Great Valley
  7. Peninsular Ranges
  8. Transverses Ranges
  9. San Andreas Fault
  10. Salton trough
  11. Mojave Desert
  12. Basin and Range

  Grades: may be comparative (scaled or curve) or based on an absolute standard.
  Evaluation will include:
  1. Objective quizzes/exams (including true/false, multiple choice, or matching).
  2. Subjective quizzes/exams (including fill-in blank and essay).
  3. Homework – including a “time-slice” interpretation of the Geologic Map of California.

Texts and Other Instructional Materials

Adopted Textbook

1. Harden *California Geology* Edition: 2nd 2004

Supplemental Texts

1. Geologic Map of California, 1:2,500,00, USGS and California Division of Mine and Geology, 1966

Instructional Materials

None

Student Learning Outcomes

1. GEOL131 SLO1 - Differentiate between and identify all three basic rock types and explain the rock cycle in plate tectonics terms.
2. GEOL131 SLO2 - Compare and contrast the three basic types of plate boundaries and cite examples of where each is found in California.
3. GEOL131 SLO3 - Compare and contrast the various methods of dating geologic materials and integrate knowledge of rock-forming processes with geologic dating methods to summarize the geologic history of California.
4. GEOL131 SLO4 - Accurately describe and illustrate the various internal (e.g. plate tectonics, earthquakes, volcanoes, etc.) and external (e.g. streams, groundwater, glaciers, etc.) earth processes active in California.
5. GEOL131 SLO5 - Extract and use information from topographic maps, geologic maps, cross sections, stratigraphic columns, and aerial photographs in order to summarize the geologic history of California.
6. GEOL131 SLO6 - Accurately describe and illustrate the geologic history of California.

Distance Learning

This course is not Distance Learning.

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Board Approval: 05/16/2000
PCA Established:
DL Conversion:
Date Reviewed: Fall 2014
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 141
Catalog Course Title: Environmental Geology
Banner Course Title: Environmental Geology

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	0.000	0.0 - 0.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	3.0	48.0 - 54.0	3.0
Total Contact Hours	3.0	48.0 - 54.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisories
ENGL 101 Freshman Composition: Exposition
and

Advisories
MATH 311 Algebra 1

Entrance Skills

Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.

- improve writing skills and techniques.
- effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- conduct research effectively including investigation, collection, evaluation, and documentation, and present the findings in acceptable written form.
- access and use information ethically and effectively.
- identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- state, use and identify the basic real number axioms.
- evaluate and simplify variable expressions.
- solve linear equations in one variable.
- solve and graph solutions to linear inequalities in one variable.
- graph linear equations in two variables using slope and intercept methods.
- add, subtract, multiply and divide polynomials.
- factor polynomials
- use factoring to simplify, multiple, and divided rational expressions.
- use factoring to solve quadratic equations.
- solve word problems at the elementary algebra level.
- evaluate and simplify expressions involving square roots

Catalog Description

A study of humankind's scientific, social, and ethical interactions with earth systems. Topics include earth processes, geologic hazards, the earth's renewable and non-renewable resources, and the earth's ability accept the products of human waste. This course is not open to students who have received credit for Environmental Studies 102.

Course Content

Lecture

1. Introduction; The scientific method. Examining earth’s systems; Evaluation of population pressures.
2. An inventory of earth’s materials: atoms, minerals, rocks and the rock cycle.
3. The analytical tools and principles used by a geologist.
4. This dynamic planet: plate tectonics and processes at plate boundaries.
5. Plate tectonics and earthquakes.
6. Plate tectonics and volcanoes.
7. Streams and flooding: or why you shouldn’t develop in a floodplain.
8. Shoreline processes: examining the dynamic interface between land and sea.
9. Mass wasting: analyzing earth motions due to gravity.
10. Glaciers, wind and climate: natural and unnatural processes.
11. Water as a resource: an evaluation of surface and underground water.
12. An inventory of soil: the rise and fall of civilizations.
13. Mineral resources: metals and materials from the earth.

14. Society's lifeblood: analyzing our fossil-fuel energy resources.
15. Evaluating our non-fossil fuel energy alternatives.
16. The water we drink and the air we breathe: water and air pollution.

Course Objectives

At the end of the course, the student will be able to:

1. analyze civilization's dependence on, and relationship to, earth's dynamic systems.
2. interpret earth systems and their relationship to environmental issues.
3. evaluate environmental issues regarding earth resources, hazards and the earth's ability to accept waste.

Methods of Instruction

- **Demonstration**
- **Lecture**

Assignments

- **Other Assignments**
  Homework exercises in:
  1. geologic tools and principles
  2. stream hydrograph interpretation and flood risk evaluation

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Methods of Evaluation

- **Exams/Tests**
- **Quizzes**
- **Research Projects**
- **Home Work**
- **Other**
  Evaluation will include:
  1. Objective quizzes/exams (including true/false, multiple choice, or matching).
  2. Subjective quizzes/exams (including fill-in blank and essay).
  3. Weekly writing assignments consisting of abstracts of magazine and newspaper articles.
  4. Homework assignments.
  Grades: may be comparative (scaled or curve) or based on an absolute standard.

  Sample Essay Questions:
  1. Define, compare and contrast the following earth resources: a) renewable, b) potentially renewable, and c) non-renewable. Include in your analysis at least three examples of each resource category. Also, compare the relative rates of production versus use by humans, for each resource category. Examine ground water specifically. Why is ground water classified as a potentially renewable resource?
  2. Compare and contrast soil salinization today in the Coachella Valley, CA to soil salinization in the past in Mesopotamia.
  3. Assess each of the following energy sources in terms of its energy quality, renewability, abundance, price, and environmental/social issues: a) geothermal b) ethanol c) oil d) wind e) landfill gas. Why has our society continued to rely so strongly on fossil fuels despite significant environmental concerns?
  4. Compare subsistence slash and burn agricultural practices in tropical rain forests to slash and burn agriculture currently being practiced in Brazil. Your answer should include an explanation of why one practice is sustainable while the other is unsustainable.
  5. Compare and contrast the agricultural productivity of the upper mid-western United States (chernozem soils) to that of New Guinea (laterite soils).

Texts and Other Instructional Materials

Adopted Textbook

1. Hudson, T. *Living with Earth: An Introduction to Environmental Geology* Edition: 1 2011

Supplemental Texts

1. Articles from the internet, newspapers, and periodicals (LA Times, local newspapers, Discover, Scientific American, National Geographic)

Instructional Materials

None

Student Learning Outcomes

1. GEOL141 SLO1 - Interpret earth systems and their relationship to environmental issues.
2. GEOL141 SLO2 - Evaluate environmental issues regarding earth resources, geologic hazards, and the earth's ability to accept waste.
3. GEOL141 SLO3 - Identify local geologic features and describe the geologic processes responsible for their formation.
4. GEOL141 SLO4 - Analyze civilization's dependence on, and relationship to, earth's dynamic systems.
5. GEOL141 SLO5 - Evaluate geologic hazards and construct mitigation procedures.

Distance Learning

This course is not Distance Learning.

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Board Approval: 05/09/2017
PCA Established:
DL Conversion:
Date Reviewed: Spring 2017
Catalog Year: 2018 - 2019

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 189
Catalog Course Title: Independent Projects in Geology
Banner Course Title: Independent Projects in Geolog

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	-	-	
Lab	3.000 - 9.000	48.0 - 54.0 to 144.0 - 162.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	3.0 - 9.0	48.0 - 54.0 to 144.0 - 162.0	1.0 - 3.0
Total Contact Hours	3.0 - 9.0	48.0 - 54.0 to 144.0 - 162.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

None

Entrance Skills

None

Catalog Description

Courses for students capable of independent work who demonstrate the need or desire for additional study beyond the regular curriculum. Enrollment allows students to pursue activities such as directed field experience, research, or development of skills and competencies under faculty advisement and supervision. Independent projects may be earned in most discipline.
Students wishing to enroll in Independent Projects should contact the appropriate instructor identified in the class schedule. If the project proposed is acceptable to that instructor, a contract will be developed. All contracts for these classes must be completed and submitted to the Records Office no later than the end of the second week of the semester.

Units are awarded depending upon satisfactory performance and the amount of time committed by the student to the course. Allowable units vary according to discipline, and are based on the following formula:
1 unit- 48 hours per semester
2 units - 96 hours per semester
3 units - 144 hours per semester

Course Content

Lecture

To be worked out between the student and the instructor.

Course Objectives

At the end of the course, the student will be able to:

1. complete a contractual assignment, mutually agreeable between student and instructor.
2. keep an organized, legible and complete record of all procedures, data and results of the project.

Methods of Instruction

- **Lab**
- **Methods of Instruction Description:**
  Independent study.

Assignments

- **Other Assignments**
  -

Methods of Evaluation

- **Research Projects**
- **Projects**
- **Other**
  The students and instructors will have met the objectives through pre-designated and periodic discussions with the student, and review of the record book throughout and at the end of the project.

Texts and Other Instructional Materials

Adopted Textbook
None

Supplemental Texts
None

Instructional Materials
None

Student Learning Outcomes

1. The student has satisfactorily completed the project as outlined in the contract.

Distance Learning

This course is not Distance Learning.

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Board Approval:
PCA Established:
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 199A
Catalog Course Title: Topics in Geology: CA Deserts
Banner Course Title: Topics in Geology: CA Deserts

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 - 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites

None

Entrance Skills

None

Catalog Description

A 90 hour field trip which will explore geologic features and geologic history of selected portions of California's deserts. The course is divided into two field trips: first to the Mojave Desert and to Death Valley National Monument (prior to and partly during spring recess), and second to the southern California desert near the Salton Sea and Anza-Borrego State Park (in the latter part of May).

Course Content

Lecture

1. Organizational Meeting and Discussion of the Course Requirements, Goals, and Objectives.
2. Geological and Biological Aspects of the Death Valley Area. Distribution of Materials, Discussion of Proposed Destinations Enroute and Within the Area. Slide Presentations Showing Biological and Geological Features of Deserts.

For the duration of the course

1. Trip to Death Valley with Stops at Red Rock Canyon, Trona, and Other Appropriate Areas.
2. Set Up Camp and Explore Mosaic Canyon, Devil's Golf Course, Pupfish areas, and Endemic Plants.
3. Side excursions to Dante's View, Greenwater Canyon, Titus Canyon
4. Presentation of Materials and Trip Outline for Borrego State Park, San Diego County.
5. Organizational Meeting and Lecture on Specific Geology and Biology of Borrego Area.
6. Trip to Borrego. Set Up Camp and Investigate Borrego Canyon, Font's Point and Badland's Geology
7. Calcite Canyon,_Elephant Trees, Pumpkin Patch. Evenings to be Used for Reptile Observation and Limited Collecting Outside of the Park Boundaries. Live Trapping of Small Mammals for Observation and Then Release to Demonstrate the Abundance of Life in the Desert Environment.
8. Observation of Fossils and Plants in Alvorsen Canyon and Return.
9. On-the-Spot Lectures and Investigation Where Appropriate are an Integral Part of the Course.
10. Observations of Other Selected Portions of the Salton Trough.

Course Objectives

At the end of the course, the student will be able to:

1. observe and collect data about geological features typical of desert environments.
2. identify common desert geological features.
3. maintain a notebook describing geologic features and solve problems encountered in the field.
4. participate in the cooperative experience of camping out in a desert environment with a group of individuals.
5. observe some major astronomical features through the use of a telescope in an optimum viewing environment away from city lights.
6. compile a synthesis of the geologic history of selected portions of the Mojave and Anza-Borrego deserts.

Methods of Instruction

- **Lab**
- **Lecture**

Assignments

- **Other Assignments**
  The students will complete a workbook and notebook of observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and complete solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and critical thought.

Texts and Other Instructional Materials

Adopted Textbook
None

Supplemental Texts

1. Camping equipment.
2. Various handouts pertaining to specific features or areas.
3. Topographic and geologic maps of areas visited.
4. Hunt, C. B. Death Valley: Geology, Ecology, Archaeology. University of California Press, 1975.
5. Maxon, J. H. Death Valley, Origin and Scenery. Death Valley Natural_History Association, 1963.

Instructional Materials
None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

Generated on: 1/22/2020 4:52:53 PM

Board Approval:
PCA Established:
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 199B
Catalog Course Title: Topics in Geology (Field Geology of the California Coast)
Banner Course Title: Topics in Geology: CA Coast

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 - 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites

None

Entrance Skills

None

Catalog Description

A 90 hour field trip which will explore the geologic features and geologic history of selected portions of the California Coast, which may include Point Conception, Vandenberg, Point Sal, Port San Luis, Morro Bay, Monterey Bay, as well as many areas encountered enroute.

Course Content

Lecture

1. Organizational Meeting and Discussion of the Course Requirements, Goals, and Objectives.
2. Slide Presentation and Lectures About the Geology and Biology of Coastal California.

For the duration of the course

1. Trip to Coastal Areas.
2. Set up Camp and Explore Selected Portions of the California Coast.
3. Explore Local Areas Such as Morro Bay, Point Sal, Oso Flaco, Vandenberg, Figueroa Mountain, and the Central Coast Ranges.
4. On-the-Spot Lectures and Investigations Where Appropriate are an Integral Part of the Course

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Course Objectives

At the end of the course, the student will be able to:

1. observe and collect data about geological features typical of coastal areas.
2. identify geologic features found along the California Coast.
3. maintain a notebook describing geologic features and solve problems encountered in the field.
4. participate in the cooperative experience of camping out in a coastal environment with a group of individuals.
5. compile a synthesis of the geologic history of selected portions of the California Coast.

Methods of Instruction

- **Lab**
- **Lecture**

Assignments

- **Other Assignments**
  The students will complete a workbook and notebook of observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and complete solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and critical thought.

Texts and Other Instructional Materials

Adopted Textbook
None

Supplemental Texts

1. Camping equipment.

2. Various handouts pertaining to specific features or areas.
3. Topographic and geologic maps of areas visited.
4. Sharp, R. S. Field Guide - Coastal Southern California. Kendall Hunt, 1978.
5. Harbaugh, J. W. Geology Field Guide to Northern California. William C. Brown, 1974.

Instructional Materials
None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

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Board Approval:
PCA Established:
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 199C
Catalog Course Title: Topics in Geology: Sierra NV
Banner Course Title: Topics in Geology: Sierra NV

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 - 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites

None

Entrance Skills

None

Catalog Description

A 90 hour field trip which will explore the geologic features and geologic history of selected portions of the Sierra Nevadas (during the summer break).

Course Content

Lecture

1. Organizational Meeting and Discussion of the Course Requirements, Goals, and Objectives.

2. Slide Presentation and Lecture About the Geology and Biology of the Sierra Nevadas.

For the duration of the course

1. Trip to Sierras.
2. Set up Camp and Explore Selected Portions of the Sierra Nevadas.
3. Explore Sierran Foothill Geology and the Geology of Yosemite Park, and Sequoia-Kings Canyon Parks.
4. On-the-spot Lectures and Investigation Where Appropriate are an Integral Part of the Course.

Course Objectives

At the end of the course, the student will be able to:

1. observe and collect data about geological features typical of the Sierra Nevadas.
2. identify common Sierra Nevada geologic features.
3. maintain a notebook describing geologic features and solve problems encountered in the field.
4. participate in the cooperative experience of camping out in the Sierra Nevadas with a group of individuals.
5. observe some major astronomical features through the use of a telescope in an optimum viewing environment away from city lights.
6. compile a synthesis of the geologic history of selected portions of the Sierra Nevadas.

Methods of Instruction

- **Lab**
- **Lecture**

Assignments

- **Other Assignments**
  The students will complete a workbook and notebook of observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and complete solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and critical thought.

Texts and Other Instructional Materials

Adopted Textbook
None

Supplemental Texts

1. Camping equipment.
2. Various handouts pertaining to specific features or areas.

3. Topographic and geologic maps of areas visited.
4. Matthes, F. E. Geologic History of the Yosemite. USGS Prof. Paper 160, 1930.
5. Saleeby, J., et al., Geologic Guide to the Kings Canyon Highway Central Sierra Nevada, California. Cordilleran Section Geological Society of America, April 1979.

Instructional Materials
None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

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Board Approval: 12/14/2004
PCA Established:
DL Conversion:
Date Reviewed: Spring 2018
Catalog Year: 2019 - 2020

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life & Physical Sciences
Prefix and Number: GEOL 199D
Catalog Course Title: Topics in Geology:CA(Transect)
Banner Course Title: Topics in Geology:CA(Transect)

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	-	-	
Lab	6.000	96.0 - 108.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

None

Entrance Skills

None

Catalog Description

A 90 hour field trip which will explore the geologic features and geologic history of selected portions of California. The course is divided into two field trips: First a trip transecting Southern California (prior to, and partly during spring break), and a second trip transecting Northern California (in the latter part of May).

Course Content

Lecture

1. Organizational Meeting and Discussion of the Course Requirements, Goals, and Objectives.

2. Slide Presentation and Lecture About the Geology (rocks, land forms, faults, volcanoes, history) and Biology (desert environment, alpine environment, marine environment) of California.

For the duration of the course

1. Trip to Northern California (5 days) and Southern California (4 days)
2. Set up Camp and Explore Selected Portions of California.
3. On-the-Spot Lectures and Investigation Where Appropriate are an Integral Part of the Course.

Course Objectives

At the end of the course, the student will be able to:

1. observe and collect data about geological features typical of California.
2. identify common California geological features.
3. maintain a notebook describing geologic features and solve problems encountered in the field.
4. participate in the cooperative experience of camping out with a group of individuals.
5. observe some major astronomical features through the use of a telescope in an optimum viewing environment away from city lights.
6. compile a synthesis of the geologic history of selected portions of California.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Other Assignments**
  The students will complete a workbook and notebook of observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and complete solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and critical thought.

Texts and Other Instructional Materials

Adopted Textbook
None

Supplemental Texts

1. Camping equipment.
2. Various handouts pertaining to specific features or areas.
3. Topographic and geologic maps of areas visited.
4. Arthur Gibbs Sylvester, Elizabeth O'Black Gans; Roadside Geology of Southern California; Mountain Press Publishing Company (January 4, 2016)
5. David Alt, Don Hyndman; Roadside Geology of Northern and Central California, 2e; Mountain Press Publishing Company; Second edition (October 10, 2016)

Instructional Materials
None

Student Learning Outcomes

1. GEOL 199D SLO 1 - Accurately describe and illustrate the various internal and external earth processes responsible for the formation of area visited.
2. GEOL 199D SLO 2 - Identify a variety of natural features seen in the area visited and explain their formation and existence
3. GEOL 199D SLO 3 -Explain the geologic history of the area visited using the geologic timescale.
4. GEOL 199D SLO 4 -Take accurate, complete, and neat notes in a field setting.

Distance Learning

This course is not Distance Learning.

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Board Approval:
PCA Established: 03/13/2014
DL Conversion:
Date Reviewed: Spring 2014
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Chemistry (Masters Required) or Earth Science (Masters Required) or Physics/Astronomy (Masters Required) or Physical Sciences (Masters Required)

Department: Life & Physical Sciences

Prefix and Number: PHSC 111

Catalog Course Title: Matter, Energy and Molecules

Banner Course Title: Matter and Energy

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	4.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites

Prerequisite
MATH 311 Algebra 1

Advisories
ENGL 514 Writing Skills 4
or eligibility for ENGL 101

Entrance Skills

Upon entering this course, the student should be able to:

MATH 311 - Algebra 1

- state, use and identify the basic real number axioms.
- evaluate and simplify variable expressions.
- solve linear equations in one variable.
- solve and graph solutions to linear inequalities in one variable.

- graph linear equations in two variables using slope and intercept methods.
- add, subtract, multiply and divide polynomials.
- factor polynomials
- use factoring to simplify, multiple, and divided rational expressions.
- use factoring to solve quadratic equations.
- solve word problems at the elementary algebra level.
- evaluate and simplify expressions involving square roots

ENGL 514 - Writing Skills 4

- write essays, including argumentation, that integrate and synthesize course readings and are clearly focused, fully developed, and logically organized.
- produce in-class or timed essays that illustrate organizing, composing, revising, editing, and time-management skills.
- analyze and paraphrase multiple texts: drawing conclusions, making generalizations, and analyzing arguments.
- write essays to specific audiences using an appropriate voice for those readers.
- formulate an essay with a clear thesis statement or central idea.
- organize essays in which the topic sentences and paragraph details support the thesis.
- construct sentences that demonstrate control of sentence variety and effective word choice, using mostly college-level diction.
- use strategies to accommodate and learn unfamiliar vocabulary.
- proofread and edit essays so that they exhibit few gross errors in English grammar, use, or punctuation.
- identify and evaluate supporting evidence.
- follow prescribed documentation methods and properly use outside sources.

Catalog Description

Introduction to the basic principles of physical science and applications of these principles in everyday life. Topics include, but are not limited to, the following: scientific method, measurements, force and motion, work and energy, heat, waves, fluids, electricity, atomic physics, matter, compounds, molecules, chemical reactions, and ions.

Course Content

Lecture

Lecture Content:

1. Use of the Scientific Method
2. Newton's Laws of Motion
3. Momentum and Energy
4. Work and Energy
5. Thermodynamics: Temperature and Heat Transfer
6. Fluid Mechanics, Buoyancy, Archimedes' and Bernoulli's Principles
7. Waves and wave Effects
8. Electricity and magnetism
9. Atomic and Nuclear Physics
10. Periodic Table of Elements and periodic trends to atomic structure

11. Elements, Compounds, Molecules, and Ions. Atomic bonding
12. Mixtures
13. Chemical Reactions, Stoichiometry, and Balancing Equations
14. Acids, Bases, and Oxidation/Reduction Reactions
15. Organic Chemistry

Laboratory Content:

1. Measurements and use of lab equipment, lab safety
2. Newton's Laws of Motion
3. Momentum, Impulse, and Energy
4. Work and Energy
5. Thermodynamics: Temperature and Heat Transfer
6. Fluid Mechanic, Buoyancy, Archimedes' and Bernoulli's Principles
7. Waves and Wave Effect
8. Electricity and Magnetism
9. Atomic and Nuclear Physics
10. Elements, Atomic binding, Compounds, Molecules and Ions
11. Mixtures
12. Chemical Reactions and stoichiometry
13. Acids, Bases, and Oxidation/Reduction Reactions

Course Objectives

At the end of the course, the student will be able to:

1. Lecture Objectives:
2. describe the methods and standards of science and the fundamental principles that govern the universe.
3. state the major scientific principles in both verbal and in simplified mathematical form.
4. give examples of processes which illustrate the application of a major scientific principle.
5. Laboratory Objectives:
6. carry out laboratory experiments; set up equipment, take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.
7. understand fundamentals of taking and recording measurements including measuring length, area, volume, mass, density, temperature, electric current, motion, significant figures, converting between units and scientific notion.

Methods of Instruction

- **Methods of Instruction Description:**
  Primary method is lecture using Microsoft PowerPoint to deliver course content including text, images, and video. Demonstration of scientific principles using props and equipment is also employed. The laboratory component involves some lecture, but most of the time the students work on their experiments or activities, alone or in teams, with supervision and guidance by the instructor.

Assignments

- **Outside Assignments**
  Homework assignments consist of, but are not limited to, answering assigned questions from each chapter of the textbook and/or from the instructor.

Methods of Evaluation

1. Student performance will be evaluated by the use of lecture exams, quizzes, homework, and laboratory work.

2. The exams, homework, and quizzes will consist of problem solving exercises and short essays.

Sample essay question: Describe what is meant by the term radioactive decay. Discuss how this applies to Carbon-14 and its use in archaeological sites.

Texts and Other Instructional Materials

Adopted Textbook

1. Hewitt, Suchocki and Hewitt *Conceptual Physical Science* Edition: 5th 2012

Supplemental Texts

1. Laboratory literature written by the instructor

Instructional Materials

None

Student Learning Outcomes

1. PHSC111 SLO1 - Carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of experiments.
2. PHSC111 SLO2 - Demonstrate knowledge of the scientific method and utilize it to develop hypotheses to answer why observed phenomena occur.
3. PHSC111 SLO3 - Understand and apply Newton's Laws of Motion, the concept of energy, and fluid mechanics to scientific problem solving.
4. PHSC111 SLO4 - Understand basic concepts in chemistry including subatomic particles, periodic properties, electron structure, kinetic molecular theory, heat and energy and ideal gas behavior.
5. PHSC111 SLO5 - Apply concepts of electricity and magnetism to make calculations using Ohm's Law, understand AC and DC currents and to explain how motors and generators work.
6. PHSC111 SLO6 - Apply concepts in nuclear physics and chemistry to understand radioactivity and decay.

Distance Learning

This course is not Distance Learning.

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Board Approval:
PCA Established: 03/13/2014
DL Conversion:
Date Reviewed: Spring 2014
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: Chemistry (Masters Required) or Earth Science (Masters Required) or Physical Sciences (Masters Required) or Physics/Astronomy (Masters Required)

Department: Life & Physical Sciences

Prefix and Number: PHSC 112

Catalog Course Title: Earth and the Universe

Banner Course Title: Earth & the Universe

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	4.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisories
Eligibility for MATH 311 and ENGL 101

Entrance Skills

None

Catalog Description

Introduction to the basic principles of astronomy and earth sciences and applications of these principles to everyday life. Topics include the solar system, stars, galaxies, and cosmology, structure and formation of the earth, earth quakes, volcanoes, plate tectonics, the atmosphere, the ocean, and weather.

Course Content

Lecture

Lecture Content:

1. Application of the Scientific Method in problem solving
2. Formation of the universe, stars, and our solar system
3. Observation of the Sun, Moon, and stars
4. Dynamics of the earth's atmosphere, including winds, clouds, weather, and climate
5. Air Masses, jet streams, weather, and storms
6. Plate Tectonics, plate boundaries, volcanos, earthquakes, and mountain building
7. Formation of rocks in plate tectonics terms, rock cycle
8. Mineral and Rock chemistry and identification
9. Structural Geology: folding, faulting, and earthquakes
10. Geologic Time, methods of geologic dating, fossils, and geologic history
11. Surface Processes, including streams and flooding, glaciers and climate, groundwater, and coastal dynamics as part of the hydrologic cycle

Laboratory Content:

1. Application of the Scientific Method in problem solving
2. Formation of the universe, stars, and our solar system
3. Observation of the Sun, Moon, and stars
4. Dynamics of the earth's atmosphere, including winds, clouds, weather, and climate
5. Dynamics of ocean circulation and tides
6. Air Masses, jet streams, weather, and storms
7. Plate Tectonics, plate boundaries, volcanos, earthquakes, and mountain building
8. Formation of igneous, sedimentary, and metamorphic rocks in terms of plate tectonics and the rock cycle
9. Mineral and Rock chemistry and identification
10. Structural Geology: folding, faulting, and earthquakes
11. Geologic Time, methods of geologic dating, fossils, and geologic history
12. Surface Processes, including streams and flooding, glaciers and climate, groundwater, and coastal dynamics as part of the hydrologic cycle

Course Objectives

At the end of the course, the student will be able to:

1. Lecture Content:
2. Describe the historical development of the theories of plate tectonics and continental drift, including the individuals involved and the major scientific discoveries that led to the adoption of these theories by the scientific community.
3. Articulate the major cosmological theories involving the evolution of the universe and outline the evidence supporting each.
4. Describe the driving forces of the tectonic and hydrologic cycles and how those cycles relate to the rock cycle.
5. Describe the processes within the hydrologic cycle, such as streams, glaciers, groundwater, etc.
6. Describe and use the scientific method.
7. Laboratory Content:
8. Carry out laboratory experiments: take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.
9. Identify various rocks and minerals and describe their formation in terms of plate tectonics and the hydrologic cycle.
10. Gather information from topographic maps, geologic maps, cross sections, stratigraphic columns, and aerial photographs to solve geological problems, such as natural hazard mitigation.
11. Describe the location of various night and day time sky objects. This includes, but is not limited to, the Moon, Sun, Polaris, and various constellations, depending on the season.
12. Describe and use the scientific method

Methods of Instruction

- **Lab**
- **Lecture**
- **Methods of Instruction Description:**
  Primary method is lecture using Microsoft PowerPoint to deliver course content including text, images, and video. Demonstration of scientific principles using props and equipment is also employed. The laboratory component involves some lecture, bust most of the time the students work on assignments or activities, alone or in teams, with supervision and guidance by the instructor.

Assignments

- **Outside Assignments**
  Outside assignments consist of answering assigned homework questions from each chapter of the textbook and/or from the instructor. Also, students are asked to make observations of the Sun, Moon , and stars depending on the season.

Methods of Evaluation

1. Student performance will be evaluated by the use of lecture exams, quizzes, homework, and laboratory work.
2. The exams, homework, and quizzes, will consist of problem solving exercises and short essays.

Texts and Other Instructional Materials

Adopted Textbook

1. Hewitt, Suchocki and Hewitt *Conceptual Physical Science* Edition: 5th 2012

Supplemental Texts

1. Laboratory manual assembled by the instructor.

Instructional Materials
None

Student Learning Outcomes

1. PHSC112 SLO1 - Demonstrate the ability to accurately describe and illustrate the various internal (e.g. plate tectonics, earthquakes, volcanoes, etc.) and external (e.g. streams, groundwater, glaciers, etc.) earth processes.
2. PHSC112 SLO2 - Demonstrate the ability to identify a variety of rocks and minerals and explain their formation in terms of plate tectonic theory.
3. PHSC112 SLO3 - Identify local geologic features and describe the geologic processes responsible for their formation.
4. PHSC112 SLO4 - Illustrate the interrelationships between marine and atmospheric environments.
5. PHSC112 SLO5 - Illustrate the formation of the solar system.

Distance Learning

This course is not Distance Learning.

Generated on: 4/28/2020 3:46:07 PM

Board Approval: 12/15/1998
PCA Established:
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199A
Catalog Course Title: Colorado Plateau
Banner Course Title: Colorado Plateau

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.500	24.0 - 27.0	
Lab	6.630	106.0 - 119.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	8.0	130.0 - 146.0	3.0
Total Contact Hours	8.0	130.0 - 146.0	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Advisories
Concurrent enrollment in college-level life or physical science course.

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Entrance Skills

None

Catalog Description

Intensive field study experience in introducing students to the Earth, Physical, and Space Sciences of the Colorado Plateau Physiographic Region.

Course Content

Lecture

1. Geography and Physiography of the Plateau Region
2. Geologic Time and Scale
    a. Geologic Time Scale
    b. Precambrian History of the Grand Canyon
    c. Paleozoic History of the Grand Canyon
    d. Mezoic Seaways
3. Physical Geology, Geography, and Hydrology
    a. Monument Valley
    b. Natural Bridges National Park
    c. Arches National Park, Salt Anticlines
    d. Canyonlands National park and Dead Horse Point
    e. Capitol Reef National Park
    f. Bryce National Park
    g. Zion National Park
4. Ring of Fire, Plate Tectonics
    a. Precambrian Paleogeography
    b. Paleozoic Paleogeography
    c. Mesozoic Paleogeography
    Cenozoic Activity
5. Orogenic Events, formation of Mountains
    a. Laramide Structures, Rapless Anticline, San Raphael Swell
    b. Paradox Basin, Uncompahgre Highlands and the Ancestral Rockies
    c. Colorado National Monument
6. Faults and Escarpments
    a. Origin and Tectonic Evolution of the Basin and Range

7. Cinder Cones and Volcanism

    a. Flagstaff Volcanic Field, Sunset Crater

8. Igneous and Metamorphic rocks – geochemistry

    a. Laccolith Intrusions of the Colorado Plateau

9. Caves, Rivers and Lake Systems

    a. Mithcell Caverns

    b. History of the Colorado River

    c. Goosenecks of the San Juan River

10. Natural History, Fossils, and Evolution

    a. Dinosaurs in Utah, Morrison Formation, Peleobotany

11. Engineering Construction and Human Impact – dams, aqueducts, etc.

    a. Glen Canyon Dam, Lake Powel

    b. Human Prehistory of the Colorado Plateau, Uranium inUtah

12. Integrated lessons and assignments in astronomy and space sciences

    a. Celestial Coordinates (Local, Equatorial, Galactic)

    b. Celestial Motions (Seasons, Lunar Phases, Sidereal and Synodic Periods)

    c. Stellar Evolution (Red Giants, White Dwarfs, Neutron Stars, Black Holes)

13. Stars and constellations with telescopic observations

    a. Telescope Use (Right Ascension, Declination, Optics)

    b. Galaxies, Open Clusters, Globular Clusters

    c. Constellations of the Spring and Summer Sky

    d. Bright Stars of the Spring and Summer Sky

    e. Telescope Observations of the Spring and Summer Sky

    f. Meteor Shower

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, and lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.) as applicable.
3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions
4. 4. assess the environmental of global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  Field Studies laboratory course will combine lectures and participatory activities on location such as:
  1.Collecting rock and fossil samples for examination and study
  2.Telescope observations of items identified in course outline
  3.Viewing PBS tapes on "Water and Power"
  4. Star Chart instruction on celestial motions and coordinates (possible planetarium presentation)

  An important part of the student's grade will be the preparation of a field notebook/journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a student analytical skills. An example follows:

  Students may conduct energy calculations of meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Students will discover that such an impact will release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a "nuclear winter" scenario.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Advanced student presentation to the group on a given National Park, Monument, or feature.
4.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
5.Attendance of mandatory pre-trip and post-trip seminar meeting.
6.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question:

Students will describe the threat of large-scale volcanism or large-scale meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Such an impact would release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a "nuclear winter" scenario. based on the volcanic evidence seen in the field, what are the chances that such an impact or volcanic even could occur in the future? The essay portion may address any or all aspects of this scenario.

Texts and Other Instructional Materials

Adopted Textbook

1. Hintze, Lehi, Brigham Young University *Geologic History of Utach* 1988
2. *Edmund Scientific Star and Planet Locator ($1.50)*

Supplemental Texts

1. Field Study Guide has been prepared by the instructor.
2. APPROPRIATE READINGS (Other than Textbook)
   a) Geology of Utah, by William Lee Stokes, University of Utah, 1986
   b) Pages of Stone, Geology of Western National Parks & Monuments, by Halka Chronic, The Mountaineers (Seattle, WA), 1988
   c) Cadillac Desert, The American West and its Disappearing Water, by Marc Reisner, Penguin Books (New York), 1986, 1993
   d) The Earth, An introduction to Physical Geology, by Edward Tarbuck and Fredrick Lutgens, Merrill Publishing Company (Columbus, Toronto, London, Melbourne), 1984, 1987, 1990
   e) Patterns in the Sky, Myths and Legends of the Stars, by Julius Staal McDonald and Woodward Publishing (Blacksburg, Virginia), 1988

Instructional Materials

None

Student Learning Outcomes

1. PHSC199 SLO1 - Accurately describe and illustrate the various internal and external earth processes responsible for the formation of area visited.
2. PHSC199 SLO2 - Identify a variety of natural features seen in the area visited and explain their formation and existence.
3. PHSC199 SLO3 - Explain the geologic history of the area visited using the geologic timescale.
4. PHSC199 SLO4 - Take accurate, complete, and neat notes in a field setting.

Distance Learning

This course is not Distance Learning.

Generated on: 11/6/2020 9:07:27 AM

Board Approval: 12/12/2000
PCA Established: 12/12/2000
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199B
Catalog Course Title: Colorado Plateau - Adv Studies
Banner Course Title: Colorado Plateau - Adv Studies

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.500	24.0 - 27.0	
Lab	6.630	106.0 - 119.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	8.0	130.0 - 146.0	3.0
Total Contact Hours	8.0	130.0 - 146.0	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Prerequisite
PHSC 199A Colorado Plateau

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Entrance Skills

Upon entering this course, the student should be able to:

PHSC 199A - Colorado Plateau

- outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
- operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, and lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.) as

applicable.
- compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions
- 4. assess the environmental of global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Catalog Description

A continuation of field studies in integrated physical sciences trip to the Colorado Plateau Physiographic Region where students will prepare and present an advanced level work project.

Course Content

Lecture

1. Extended Integrated Adv. Physical Sciences Project

    a. Individualized Project

2. Colorado Plateau – Earth and Physical Sciences

    a. Geography and Physiography of the Plateau Region

    b. Geologic Time and Scale

    c. Physical Geology and Hydrology

    d. Ring of Fire, Plate Tectonics

    e. Orogenic Events, formation of Mountains

    f. Faults and Escarpements

    g. Cinder Cone and Volcanism

    h. Ingeneous and Metamorphic rocks – geochemistry

    i. Caves, Rivers and Lake Systems

    j. Natural History, Fossils, and Evolution

    k. Engineering Construction and Human impact – dams, aqueducts, etc.

3. Eastern Sierra Nevada - Astronomy

    a. Integrated Lessons and Assignments in Astronomy and Space Sciences

    b. Stars and Constellations with Telescopic Observations

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  OUTSIDE ASSIGNMENTS
  Field studies laboratory course will combine lectures and participatory activities on location such as:
  1.Collecting rock, soil, and fossil samples for examination and study
  2.Telescope observations of items identified in course outline
  3.Viewing of PBS tapes on “Water and Power”
  4.Star Chart instruction on celestial motions and coordinates (possible planetarium presentation)

  An important part of the student’s grade will be the preparation of a field notebook / journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a students analytical skills. An example follows: Students may conduct energy calculations of meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Students will discover that such an impact will release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a “nuclear winter” scenario.

  Students participating in the Integrated Physical Sciences course for a second year as returning students will receive an extended and expanded learning experience in that they will operate as peer-group mentor leaders to the first year students. Leadership qualities and academic achievement will be promoted as these students work closely together on extended second year projects. The instructor will work closely with and guide students as they outline and draft their Second Year Project. This project will take the course’s academic subject matter and extend and expand it to a higher level that must then be presented to the group as a major component of the student’s grade. Examples of such projects would be implemented as part of the extensive web-based component of the course.

  Second year students, for example, would prepare the digital images, construct web pages, learn to operate the cellular transmission software and equipment, and would set-up and organize daily reports by students for posting on the web. Art and poetry and other creative writing projects can be published on the web as part of the “real-time” transmission and uploading of web pages while we are en-route.

  Second year students will also benefit from the laboratory component of the trip in that they will be able to improve and expand their rock and mineral identifying skills, their identification and recognition of geologic and geographic landforms and features, and to develop their skills in using and implementing

astronomical telescopes and other high technology equipment.

Methods of Evaluation

Describe the methods by which students and instructors will know how the objectives listed above have been met.
1.Participation in field activities.
2.Daily quizzes while in the field.
3.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
4.Attendance of mandatory pre-trip and post-trip seminar meetings.
5.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question: Students will describe the threat of large scale volcanism or large scale meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Such an impact would release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a “nuclear winter” scenario. Based on the volcanic evidence seen in the field, what are the chances that such an impact or volcanic event could occur in the future? The essay portion may address any or all aspects of this scenario.

Texts and Other Instructional Materials

Adopted Textbook

1. Hintze, Lehi, Brigham Young University *Geologic History of Utah* 1988

Supplemental Texts

1. Field Study Guide has been prepared by the instructor.
2. APPROPRIATE READINGS (Other than Textbook)
   a) Geology of Utah, by William Lee Stokes, University of Utah, 1986
   b) Pages of Stone, Geology of Western National Parks & Monuments, by Halka Chronic, The Mountaineers (Seattle, WA), 1988
   c) Cadillac Desert, The American West and its Disappearing Water, by Marc Reisner, Penguin Books (New York), 1986, 1993
   d) The Earth, An introduction to Physical Geology, by Edward Tarbuck and Fredrick Lutgens, Merrill Publishing Company (Columbus, Toronto, London, Melbourne), 1984, 1987, 1990
   e) Patterns in the Sky, Myths and Legends of the Stars, by Julius Staal McDonald and Woodward Publishing (Blacksburg, Virginia), 1988

Instructional Materials

None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

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Board Approval: 12/15/1999
PCA Established: 01/01/1999
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199C
Catalog Course Title: National Parks
Banner Course Title: National Parks

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.000	16.0 - 18.0	
Lab	4.150	66.0 - 74.5	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	5.0	82.0 - 92.5	2.0
Total Contact Hours	5.0	82.0 - 92.5	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Corequisite
PHSC 199A Colorado Plateau
or

Corequisite
PHSC 199B Colorado Plateau - Adv Studies

Advisories
Concurrent or previous enrollment in college-level life or physical science course.

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Entrance Skills

Upon entering this course, the student should be able to:

PHSC 199A - Colorado Plateau

- outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
- operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, and lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.) as applicable.
- compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions
- 4. assess the environmental of global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

PHSC 199B - Colorado Plateau - Adv Studies

- outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
- operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
- compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
- assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Catalog Description

Intensive field study experience in introducing students to the National Park System of the Colorado Plateau Physiographic Region.

Course Content

Lecture

1. History of the National Park System
2. Mitchell Caverns
3. Flagstaff Volcanic Field, Sunset Crater
4. Grand Canyon National Park
5. Glen Canyon Dam, Lake Powel
6. Navajo National Monument
7. Monument Valley
8. Goosenecks of the San Juan River
9. Natural Bridges National Park
10. Canyonlands National Park

11. Arches National Park
12. Goblin Valley
13. Capitol Reef National Park
14. Bryce Canyon National Park
15. Zion National Park
16. Colorado National Monument (or substitute)
17. Petrified Forest National Park (or substitute
18. Mesa Verde National Park (or substitute)

Course Objectives

At the end of the course, the student will be able to:

1. Outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. Operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
3. Compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. Assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

None

Assignments

- **Outside Assignments**
  Field Studies laboratory course will combine lectures and participatory activities on location such as:
  1.Collecting rock, soil, and fossil samples for examination and study
  2.Viewing of PBS tapes on “national Parks and Monuments”
  3.Preparing student a student presentation to the group on a given National Park or Monument

  An important part of the student’s grade will be the preparation of a field notebook/journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a students analytical skills. An example follows:
  Students may conduct energy calculations of water flow down the Colorado River comparing and contrasting seasonal variations with the “100 year flood” scenario. Students will discover that such rivers can carry significant loads of rock and sediment, enough to carve out the spectacular features of our most famous national parks.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Student presentation to the group on a given National Park, Monument, or feature.
4.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
5.Attendance of mandatory pre-trip and post-trip seminar meetings.
6.Additional writing assignments (including essays) as may be warranted by the topics

Sample Essay Question:
Students will describe the pros and cons of the National Park and Monument System? Do we protect or exploit these pristine areas? What has been the human impact of such large numbers of visitors on the wildlife, environment, and geography? Do the benefits outweigh the harm we cause? The essay portion may address any or all of these aspects.

Texts and Other Instructional Materials

Adopted Textbook

1. Chronic, Halka *Pages of Stone, Geology of Western National Parks & Monuments* 1988

Supplemental Texts

1. Field Study Guide has been prepared by the instructor
2. APPROPRIATE READINGS (Other than Textbook)
   1.Pages of Stone, Geology of Western National Parks & Monuments, by Halka Chronic The Mountaineers (Seattle WA), 1988
   2.Geology of National Parks, by Ann G. Harris & Ether Tuttle, Kendall/Hunt Publishing Company (Dubuque, Iowa), 1975, 1977, 1983, 1990
   3.Cadillac Desert, The American West and its Disappearing Water, by Marc Reisner, Penguin Books (New York), 1986, 1993
   4.The Earth, An Introduction to Physical Geology, by Edward Tarbuck and Frederick Lutgens, Merrill Publishing Company (Columbus, Toronto, London, Melbourne), 1984, 1987, 1990

Instructional Materials

None

Student Learning Outcomes

1. PHSC199 SLO1 - Accurately describe and illustrate the various internal and external earth processes responsible for the formation of area visited.
2. PHSC199 SLO2 - Identify a variety of natural features seen in the area visited and explain their formation and existence.
3. PHSC199 SLO3 - Explain the geologic history of the area visited using the geologic timescale.
4. PHSC199 SLO4 - Take accurate, complete, and neat notes in a field setting.

Distance Learning

This course is not Distance Learning.

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Board Approval: 05/13/2003
PCA Established: 01/01/2003
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199D
Catalog Course Title: National Parks - Adv Studies
Banner Course Title: National Parks - Adv Studies

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.000	16.0 - 18.0	
Lab	5.000	80.0 - 90.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Corequisite
PHSC 199A Colorado Plateau
or

Corequisite
PHSC 199B Colorado Plateau - Adv Studies

Advisories
Concurrent or previous enrollment in college-level life or physical science course.

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Prerequisite
PHSC 199C National Parks

Entrance Skills

Upon entering this course, the student should be able to:

PHSC 199A - Colorado Plateau

- outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
- operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, and lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.) as applicable.
- compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions
- 4. assess the environmental of global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

PHSC 199B - Colorado Plateau - Adv Studies

- outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
- operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
- compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
- assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

PHSC 199C - National Parks

- Outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
- Operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
- Compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
- Assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Entrance Skills Other (Legacy)

1. outline the formation of the physical features of the geographical region of interest/study in context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.

2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.

3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to aware of the educational requirements needed to successfully pursue these career directions.

4. assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water right, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Catalog Description

A continuation of field studies relating to the National Park System of the Colorado Plateau physiographic region. Students will prepare and present an advanced-level work project.

Course Content

Lecture

1. History of the National Park System
2. Mitchell Cavers
3. Flagstaff Volcanic Field, Sunset Crater
4. Grand Canyon National Park
5. Glen Canyon Dam, Lake Powel
6. Navajo National Monument
7. Monument Valley
8. Goosenecks of the San Juan River
9. Natural Bridges National Park
10. Canyonlands National Park
11. Arches National Park
12. Goblin Valley
13. Capitol Reef National Park
14. Bryce Canyon National Park
15. Zion National Park
16. Colorado National Monument (or substitute)
17. Petrified Forest National Park (or substitute)
18. Mesa Verde National Park (or substitute)

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. assess the environmental of global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  Field Studies laboratory course will combine lectures and participatory activities on location such as:
  1.Collecting rock, soil, and fossil samples for examination and study
  2.Viewing of PBS tapes on “National Parks and Monuments”
  3.Preparing presentation to the group on a given National park or monument

  An important part of the student’s grade will be the preparation of a field notebook/journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a student analytical skills. For Example:

  Students may conduct energy calculation of water flow down the Colorado River comparing and contrasting seasonal variations with the “100 year flood” scenario. Students will discover that such rivers can carry significant loads of rock and sediment, enough to carve out the spectacular features of our most famous national parks.

  Second year students, for example, would prepare the digital images, construct web pages, learn to operate the cellular transmission software and equipment, and would set-up and organize daily reports by students for posting on the web. Art and poetry and other creative writing projects can be published on the web as part of the “real-time” transmission and uploading of web pages while we are en-route. Second year students will also benefit from the laboratory component of the trip in that they will be able to improve and expand their rock and mineral identifying skills, their identification and recognition of geologic and geographic landforms and features, and develop their skills in using and implementing GPS units and software and other technology equipment.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Advanced student presentation to the group on a given National Park, Monument, or feature.
4.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
5.Attendance of mandatory pre-trip and post-trip seminar meeting.
6.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question:
Students will describe the pros and cons of the National Park and Monument System. Do we protet or exploit these pristine area? What has been the human impact of such large numbers of visitors on the wildlife, environment, and geography? Do the benefits outweigh the harm we cause? The essay portion may address any or all of these aspects.

Texts and Other Instructional Materials

Adopted Textbook

1. Pages of Stone, Geology of Western National Parks & Monument *Chronic, Halka* 1988

Supplemental Texts

1. Field study guide has been prepared by the instructor.
2. APPROPRIATE READINGS (other than textbook)
   a) Chronic, Halka. Pages of Stone, Geology of Western National Parks & Monuments. The Mountaineers (Seattle WA), 1988
   b) Harris, Ann G. and Tuttle, Ether. Tuttle Geology of National Parks. Kendall/Hunt Publishing Company (Dubuque, Iowa), 1975, 1977, 1983, 1990
   c) Reisner, Marc. Cadillac Desert, The American West and its Disappearing Water. Penguin Books (New York), 1986, 1993
   d) Tarbuck, Edward and Lutgens, Fredrick. The Earth, An Introduction to Physical Geology. Merrill Publishing Company (Columbus, Toronto, London, Melbourne), 1984, 1987, 1990

Instructional Materials
None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

Generated on: 11/6/2020 9:10:35 AM

Board Approval: 12/15/1998
PCA Established:
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199E
Catalog Course Title: Death Valley
Banner Course Title: Death Valley

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.000	16.0 - 18.0	
Lab	3.750	60.0 - 67.5	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	4.5	76.0 - 85.5	2.0
Total Contact Hours	4.5	76.0 - 85.5	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Advisories
Concurrent or previous enrollment in college-level life or physical science course.

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Entrance Skills

None

Catalog Description

Intensive field study experience in introducing students to the Earth, Physical, and Space Sciences of the Death Valley Region.

Course Content

Lecture

1. Geologic Time and Scale

    a. Geologic Time Scale

2. Physical Geology, Geography, and Hydrology

    a. Death Valley Sand Dunes, Dunes and Cross-Bedding

    b. Rainbow Basin Synclines and Anticlines

    c. Wineglass Springs Canyon Fan
    Artist Drive

    d. Zabriskie Point

3. Ring of Fire, Plate Tectonics

    a. Tectonic rift Zones; Converging, Diverging, Transform

    b. San Andreas Fault (Intro to Plate Tectonics)

    c. Basin and Range, formation of mountains

    d. Mormon Point Turtleback

    e. Dantes View

    f. Aguereberry Point, Mt. Whitney and Bad Water

4. Faults and Escarpments

    a. Faults Motions; Normal, Reverse, and thrust Faults

    b. Charlie Brown Road Cut

5. Cinder Cones and Volcanism

    a. Ubehebe Crater Field

    b. Cinder Hill and Shoreline Butte

6. Igneous and Metamorphic rocks – geochemistry

    a. Jubilee Pass (metamorphics)

    b. Pleistocene Drainage System

7. Pleistocene Lakes and Drainage Systems

    a. Elevations of Pleistocene Lake Basins

    b. Afton Canyon and Mosaic Canyon
    Formation of Offshore Bars

    c. Devil's Golf Course

8. Natural History, Fossils, and Evolution

    a. Barstovian vs. Pleistocence Fossils

    b. Furnace Creek Wash

    c. Salt Creek and Darwinian Evolution

9. Engineering Construction and Human Impact – dams, aqueducts, etc.

    a. Calico Gold Mining

    b. Scotty's Castle

    c. Gower Gulch

10. Integrated lessons and assignments in astronomy and space sciences

    a. Celestial Coordinates (Local, Equatorial, Galactic)

    b. Celestial Motions (Seasons, Lunar Phases, Sidereal and Synodic Periods)

    c. Stellar Evolution (Red Giants, White Dwarfs, Neutron Stars, Black Holes)

11. Stars and constellations with telescopic observations

    a. Telescope Use (Right Ascension, Declination, Optics)

    b. Galaxies, Open Clusters, Globular Clusters

    c. Constellations of the Spring and Summer sky

    d. Telescope Observations of the Spring and Summer sky

    e. Lyrids Meteor Shower (max in mid-April)

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  Field Studies laboratory course will combine lectures and participatory activities on location such as:
  1.Collecting rock, soil, and fossil samples for examination and study
  2.Telescope observations of items identified in course outline
  3.Viewing of PBS tapes on "Water and Power"
  4.Star Chart instruction on celestial motions and coordinates (possible planetarium presentation)

  An important part of the student's grade will be the preparation of a field notebook/journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a students analytical skills. An example follows:
  Students may conduct energy calculations of meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Students will discover that such an impact will release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a "nuclear winter" scenario.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
4.Attendance of mandatory pre-trip and post-trip seminar meetings.
5.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question:
Students will describe the threat of large-scale volcanism or large-scale meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Such an impact would release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a "nuclear winter" scenario. Based on the volcanic evidence seen in the field, what are the chances that such an impact or volcanic event could occur in the future? The essay portion may address any or all aspects of this scenario.

Texts and Other Instructional Materials

Adopted Textbook

1. *Edmund Scientific Star and Planet Locator ($1.50)*

Supplemental Texts

1. Field Study Guide has been prepared by the instructor.

Instructional Materials
None

Student Learning Outcomes

1. PHSC199 SLO1 - Accurately describe and illustrate the various internal and external earth processes responsible for the formation of area visited.
2. PHSC199 SLO2 - Identify a variety of natural features seen in the area visited and explain their formation and existence.
3. PHSC199 SLO3 - Explain the geologic history of the area visited using the geologic timescale.
4. PHSC199 SLO4 - Take accurate, complete, and neat notes in a field setting.

Distance Learning

This course is not Distance Learning.

Generated on: 11/6/2020 9:11:53 AM

Board Approval: 12/12/2000
PCA Established: 08/01/2000
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199F
Catalog Course Title: Death Valley - Adv Studies
Banner Course Title: Death Valley - Adv Studies

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.000	16.0 - 18.0	
Lab	3.750	60.0 - 67.5	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	4.5	76.0 - 85.5	2.0
Total Contact Hours	4.5	76.0 - 85.5	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Entrance Skills

Entrance Skills Other (Legacy)

Previous course in PHSC Field Studies – D Valley

Catalog Description

A continuation of field studies in integrated physical science trip to the Death Valley Region where students will prepare and present an advanced level work project.

Course Content

Lecture

(Actual localities may vary depending on road conditions, weather, etc.)

1. Extended Integrated Adv. Physical Sciences Project
    a. Individualized Project 16 (lecture)
2. Death Valley – Earth and Physical Sciences
    a. Geologic Time and Scale 4 hrs (lab)
    b. Physical Geology and Hydrology 7 hrs (lab)
    c. Ring of Fire, Plate Tectonics 4 hrs (lab)
    d. Basin and Range, formation of Mountains 7 hrs (lab)
    e. Faults and Escarpements 7 hrs (lab)
    f. Cinder Cone and Volcanism 4 hrs (lab)
    g. Ingeneous and Metamorphic rocks – geochemistry 4 hrs (lab)
    h. Pleistocene Drainage System 8 hrs (lab)
    i. Natural History, Fossils, and Evolution 4 hrs (lab)
    j. Engineering Construction and Human impact – dams, aqueducts, etc. 4 hrs (lab)
3. Eastern Sierra Nevada - Astronomy
    a. Integrated Lessons and Assignments in Astronomy and Space Sciences 4 hrs (lab)
    b. Stars and Constellations with Telescopic Observations 3 hrs (lab)

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. assess the environmental or global impact of industry related activities associated with the topic of

interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  Field studies laboratory course will combine lectures and participatory activities on location such as:
  1. Collecting rock, soil, and fossil samples for examination and study
  2. Telescope observations of items identified in course outline
  3. Viewing of PBS tapes on “Water and Power”
  4. Star Chart instruction on celestial motions and coordinates (possible planetarium presentation)

  An important part of the student’s grade will be the preparation of a field notebook / journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a students analytical skills. An example follows: Students may conduct energy calculations of meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Students will discover that such an impact will release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a “nuclear winter” scenario.

  Students participating in the Integrated Physical Sciences course for a second year as returning students will receive an extended and expanded learning experience in that they will operate as peer-group mentor leaders to the first year students. Leadership qualities and academic achievement will be promoted as these students work closely together on extended second year projects. The instructor will work closely with and guide students as they outline and draft their Second Year Project. This project will take the course’s academic subject matter and extend and expand it to a higher level that must then be presented to the group as a major component of the student’s grade. Examples of such projects would be implemented as part of the extensive web-based component of the course.

  Second year students, for example, would prepare the digital images, construct web pages, learn to operate the cellular transmission software and equipment, and would set-up and organize daily reports by students for posting on the web. Art and poetry and other creative writing projects can be published on the web as part of the “real-time” transmission and uploading of web pages while we are en-route.

  Second year students will also benefit from the laboratory component of the trip in that they will be able to improve and expand their rock and mineral identifying skills, their identification and recognition of geologic and geographic landforms and features, and to develop their skills in using and implementing astronomical telescopes and other high technology equipment.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
4.Attendance of mandatory pre-trip and post-trip seminar meetings.
5.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question: Students will describe the threat of large scale volcanism or large scale meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Such an impact would release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a “nuclear winter” scenario. Based on the volcanic evidence seen in the field, what are the chances that such an impact or volcanic event could occur in the future? The essay portion may address any or all aspects of this scenario.

Texts and Other Instructional Materials

Adopted Textbook

1. *Edmund Scientific Star and Planet Locator*

Supplemental Texts

1. Field Study Guide has been prepared by the instructor.

Instructional Materials
None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

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Board Approval: 12/15/1998
PCA Established:
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199G
Catalog Course Title: Eastern Sierra NV
Banner Course Title: Eastern Sierra NV

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.000	16.0 - 18.0	
Lab	3.750	60.0 - 67.5	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	4.5	76.0 - 85.5	2.0
Total Contact Hours	4.5	76.0 - 85.5	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Advisories
Concurrent or previous enrollment in college-level life or physical science course.

Entrance Skills

None

Catalog Description

Intensive field study experience in introducing students to the Earth, Physical, and Space Sciences of the Eastern Sierra Nevada.

Course Content

Lecture

1. Geologic Time and Scale

    a. Geologic Time Scale

2. Physical Geology, Geography, and Hydrology

    a. Owens Valley, Mammoth, to Mono Lake

    b. Sherwin Grade – 7000 ft., Deadman Pass – 8041 ft. (Geography of Caldera)

3. Ring of Fire, Plate Tectonics

    a. Tectonic rift Zones; Converging, Diverging, Transform

    b. San Andreas Fault (Intro to Plate Tectonics)

4. Basin and Range, formation of Mountains

    a. Mt. Whitney and Alabama Hills (Formation of Basin and Range, Sierras)
    Tioga Pass (Sierra Nevada Batholith, Granites)

5. Faults and Escarpments

    a. Faults Motions; Normal, Reverse, and thrust Faults

    b. Lone Pine Earthquake of 1872 (13 foot escarpment)

6. Cinder Cones and Volcanism

    a. Red Hill (Cinder Cones and Miocene Volcanism)

    b. Long Valley Caldera (Eruption of 710,000 years ago)

7. Recent Volcanism

    a. Inyo Craters (Groundwater and Phreatic Eruptions)

    b. Keogh Hot Springs (Geothermal Activity)

    c. Mammoth Mountain (Earthquakes and Recent Magmatic Activity)

8. Igneous and Metamorphic rocks – geochemistry

    a. Mono Craters (Formation of Obsidian, Magmatic Differentiation)

b. Mono Lake (Geochemistry, Tuffa Towers, Environmental Concerns)

9. Pleistocene Drainage System

a. Pleistocene Lakes and Drainage Systems

b. Elevations of Pleistocene Lake Basins

c. Owens Lake and Fossil Falls (Pleistocene Lakes and Drainage)

d. Alpine Glaciation

10. June Lake Loop (Pleistocene and Alpine Glaciation)

a. Convict Lake (Glacial Moraines)

11. Natural History, Fossils, and Evolution

a. Lone Pine Earthquake of 1872 (John Muir's account)

12. Engineering Construction and Human Impact – dams, aqueducts, etc.

a. LA Aqueduct (Water and Power)

13. Integrated lessons and assignments in astronomy and space sciences

a. Celestial Coordinates (Local, Equatorial, Galactic)

b. Celestial Motions (Seasons, Lunar Phases, Sidereal and Synodic Periods)

c. Stellar Evolution (Red Giants, White Dwarfs, Neutron Stars, Black Holes)

14. Stars and constellations with telescopic observations

a. Telescope Use (Right Ascension, Declination, Optics)

b. Galaxies, Open Clusters, Globular Clusters

c. Constellations of the Fall and Winter Sky

d. Bright Stars of the Fall and Winter Sky

e. Telescope Observations of the Fall and Winter Sky

f. Orionids Meteor Shower (max in mid-October)

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable.
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.
3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  Field Studies laboratory course will combine lectures and participatory activities on location such as:
  1. Collecting rock, soil, and fossil samples for examination and study
  2. Telescope observations of items identified in course outline
  3. Viewing of PBS tapes on "Water and Power"
  4. Star Chart instruction on celestial motions and coordinates (possible planetarium presentation)

  An important part of the student's grade will be the preparation of a field notebook/journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a students analytical skills. An example follows:
  Students may conduct energy calculations of meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Students will discover that such an impact will release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a "nuclear winter" scenario.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
4.Attendance of mandatory pre-trip and post-trip seminar meetings.
5.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question:
Students will describe the threat of large-scale volcanism or large-scale meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Such an impact would release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a "nuclear winter" scenario. Based on the volcanic evidence seen in the field, what are the chances that such an impact or volcanic event could occur in the future? The essay portion may address any or all aspects of this scenario.

Texts and Other Instructional Materials

Adopted Textbook

1. *Edmund Scientific Star and Planet Locator ($1.50)*

Supplemental Texts

1. APPROPRIATE READINGS (Other than textbook)
   a) Geology of the Sierra Nevada, by Mary Hill, UC Press (Berkley, Los Angeles, London), 1975
   b) Geology Underfoot in Death Valley and Owens Valley, by Robert Sharp and Allan Glazner, Mountain Press (Missoula, Montana), 1997
   c) Pages of Stone, Geology of Western National Parks & Monuments, by Halka Chronic, The Mountaineers (Seattle, WA), 1988
   d) Cadillac Desert, The American West and its Disappearing Water, by Marc Reisner, Penguin Books (New York), 1986, 1993
   e) The Earth, An introduction to Physical Geology, by Edward Tarbuck and Fredrick Lutgens, Merrill Publishing Company (Columbus, Toronto, London, Melbourne), 1984, 1987, 1990
   f) Patterns in the Sky, Myths and Legends of the Stars, by Julius Staal McDonald and Woodward Publishing (Blacksburg, Virginia), 1988

Instructional Materials

None

Student Learning Outcomes

1. PHSC199 SLO1 - Accurately describe and illustrate the various internal and external earth processes responsible for the formation of area visited.
2. PHSC199 SLO2 - Identify a variety of natural features seen in the area visited and explain their formation and existence.
3. PHSC199 SLO3 - Explain the geologic history of the area visited using the geologic timescale.
4. PHSC199 SLO4 - Take accurate, complete, and neat notes in a field setting.

Distance Learning

This course is not Distance Learning.

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Board Approval: 12/12/2000
PCA Established: 12/12/2000
DL Conversion:
Date Reviewed: Fall 2007
Catalog Year: -

Allan Hancock College
Course Outline

Discipline Placement: None
Department: Life & Physical Sciences
Prefix and Number: PHSC 199H
Catalog Course Title: Eastern Sierra NV-Adv Studies
Banner Course Title: Eastern Sierra NV-Adv Studies

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	1.000	16.0 - 18.0	
Lab	3.750	60.0 - 67.5	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	4.5	76.0 - 85.5	2.0
Total Contact Hours	4.5	76.0 - 85.5	

Number of Times Course may be Repeated
None

Grading Method
Pass/No Pass

Requisites

Limitations on Enrollment
Completion of course application and procedures for enrollment.

Entrance Skills

Entrance Skills Other (Legacy)

Previous course in PHSC Field Studies - E. Sierra

Catalog Description

A continuation of field studies in integrated physical sciences trip to the Eastern Sierra Nevada where students will prepare and present an advanced level work project.

Course Content

Lecture

(Actual localities may vary depending on road conditions, weather, etc.)

1. Extended Integrated Adv. Physical Sciences Project

    a. Individualized Project

2. Eastern Sierra Nevada – Earth and Physical Sciences

    a. Geologic Time and Scale 4 hrs (lab)

    b. Physical Geology, Geography, and Hydrology 4 hrs (lab)

    c. Ring of Fire, Plate Tectonics 4 hrs (lab)

    d. Basin and Range, Formation of Mountains 7 hrs (lab)

    e. Faults and Escarpments 3 hrs (lab)

    f. Cinder Cones and Volcanism 4 hrs (lab)

    g. Recent Volcanism 4 hrs (lab)

    h. Igneous and Metamorphic rocks - geochemistry 4 hrs (lab)

    i. Pleistocene Drainage System 8 hrs (lab)

    j. Alpine Glaciation 3 hrs (lab)

    k. Natural History, Fossils, and Evolution 4 hrs (lab)

    l. Engineering Construction and Human Impact - dams, aqueducts, etc. 4 hrs(lab)

3. Eastern Sierra Nevada - Astronomy

    a. Integrated Lessons and Assignments in Astronomy and Space Sciences 4 hrs (lab)

    b. Stars and Constellations with Telescopic Observations 3 hrs (lab)

Course Objectives

At the end of the course, the student will be able to:

1. outline the formation of the physical features of the geographical region of interest/study in the context of geography, geology, astronomy, hydrology, and physical science principles developed during the course, as applicable
2. operate equipment relevant to the in-depth study of the topic of interest (i.e. binoculars, telescopes, microscopes, hand lenses, computers, Internet technologies, digital sensors (probes) and interfaces, etc.), as applicable.

3. compare and contrast career possibilities, directions, and opportunities offered by the disciplines of in-depth study, and to be aware of the educational requirements needed to successfully pursue these career directions.
4. assess the environmental or global impact of industry related activities associated with the topic of interest/study, and to propose steps for consideration to improve or resolve present conditions (mining, water rights, pollution, hazardous waste, population density, geographical bio-diversity, etc.), as applicable.

Methods of Instruction

- **Field Trips**
- **Lab**
- **Lecture**

Assignments

- **Outside Assignments**
  Field studies laboratory course will combine lectures and participatory activities on location such as:
  1.Collecting rock, soil, and fossil samples for examination and study
  2.Telescope observations of items identified in course outline
  3.Viewing of PBS tapes on “Water and Power”
  4.Star Chart instruction on celestial motions and coordinates (possible planetarium presentation)

  An important part of the student’s grade will be the preparation of a field notebook / journal with notes, lessons, diagrams, and photographs. In the notebook, students may also work out numerical problems designed to develop a students analytical skills. An example follows: Students may conduct energy calculations of meteor impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Students will discover that such an impact will release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a “nuclear winter” scenario.

  Students participating in the Integrated Physical Sciences course for a second year as returning students will receive an extended and expanded learning experience in that they will operate as peer-group mentor leaders to the first year students. Leadership qualities and academic achievement will be promoted as these students work closely together on extended second year projects. The instructor will work closely with and guide students as they outline and draft their Second Year Project. This project will take the course’s academic subject matter and extend and expand it to a higher level that must then be presented to the group as a major component of the student’s grade. Examples of such projects would be implemented as part of the extensive web-based component of the course.

  Second year students, for example, would prepare the digital images, construct web pages, learn to operate the cellular transmission software and equipment, and would set-up and organize daily reports by students for posting on the web. Art and poetry and other creative writing projects can be published on the web as part of the “real-time” transmission and uploading of web pages while we are en-route.

  Second year students will also benefit from the laboratory component of the trip in that they will be able to improve and expand their rock and mineral identifying skills, their identification and recognition of geologic and geographic landforms and features, and to develop their skills in using and implementing astronomical telescopes and other high technology equipment.

Methods of Evaluation

1.Participation in field activities.
2.Daily quizzes while in the field.
3.Field notebook/journal with notes, lessons, essays, diagrams, and photographs.
4.Attendance of mandatory pre-trip and post-trip seminar meetings.
5.Additional writing assignments (including essays) as may be warranted by the topics.

Sample Essay Question: Students will describe the threat of large scale volcanism or large scale meteor

impacts on earth such as the one theorized to have resulted in the extinction of the dinosaurs at the cretacean-tertiary boundary 65 million years ago. Such an impact would release enough energy to vaporize huge quantities of water and earth material, potentially catapulting earth into a “nuclear winter” scenario. Based on the volcanic evidence seen in the field, what are the chances that such an impact or volcanic event could occur in the future? The essay portion may address any or all aspects of this scenario.

Texts and Other Instructional Materials

Adopted Textbook

1. *Edmund Scientific StAR and Planet Locator*

Supplemental Texts

1. APPROPRIATE READINGS (Other than Textbook)
   a) Geology of the Sierra Nevada, by Mary Hill, UC Press (Berkeley, Los Angeles, London), 1975
   b) Geology Underfoot in Death Valley and Owens Valley, by Robert Sharp and Allan Glazner, Mountain Press (Missoula, Montana), 1997
   c) Pages of Stone, Geology of Western National Parks & Monuments, by Halka Chronic The Mountaineers (Seattle WA), 1988
   d) Cadillac Desert, The American West and its Disappearing Water, by Marc Reisner, Penguin Books (New York), 1986, 1993
   e) The Earth, An Introduction to Physical Geology, by Edward Tarbuck and Frederick Lutgens, Merrill Publishing Company (Columbus, Toronto, London, Melbourne), 1984, 1987, 1990
   f) Patterns in the Sky, Myths and Legends of the Stars, by Julius Staal McDonald and Woodward Publishing (Blacksburg, Virginia), 1988
2. Field Study Guide has been provided by the instructor.

Instructional Materials

None

Student Learning Outcomes

None

Distance Learning

This course is not Distance Learning.

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Section 3: Assessment Plan

This part of the program review demonstrates alignment of courses with program student learning outcomes and lays out the program's plans for conducting assessments over the forthcoming five years.

Mission (Geology)

The mission of the Geology program is to guide students in developing an understanding the of geologic processes that are shaping Earth today as well as the changes the planet and the life it supports have undergone during the past 4.6 billion years through study in the classroom, laboratory, and field.

Program Outcomes (Geology)

1. GEOL PSLO 1: Apply the scientific method to solve geological problems.
2. GEOL PSLO 2: Identify a variety of geological specimens (e.g., rocks, minerals, fossils).
3. GEOL PSLO 3: Interpret geologic data (rocks, maps, cross sections, etc.) in terms of plate tectonic theory.
4. GEOL PSLO 4: Identify the impacts of geological processes on society and vice versa.
5. GEOL PSLO 5: Communicate effectively, in written and oral formats, the skills listed above.

Course/Program Alignment (Geology)

Outcomes will be introduced, developed and practiced with feedback, and demonstrated at their highest levels as shown below. (Key: I= Introduced; D=Developed and practiced with feedback; and M=Demonstrated at a specified mastery level). Note: Courses required for the proposed AS-T degree in Geology are Physical Geology (GEOL 100) and Historical Geology (GEOL 111), so completion of the PSLOs is linked to these courses. Other courses in the program address one or more of the PSLOs but are not required as part of the proposed degree.

	Outcome				
Course	1	2	3	4	5
GEOL 100	I, D	I, D	I, D	I, D	I, D
GEOL 111	M	M	M	M	M
GEOL 114	I, D		I, D	I, D	I, D
GEOL 131	I, D	I, D	I, D	I, D	I, D
GEOL 141	I, D	I, D	I, D	I, D	I, D

Implementation of Assessment (Geology)

Responsibility for implementing the assessment lies with the entire department. Confident that outcomes are reflected in actual coursework of your major/program, describe the mechanisms for assessment. Think of assessing your outcomes on a 4 or 5 year cycle.

PSLO	Semester assessed	Assessment method	Team to review assessment results	Resources needed to conduct assessment	Individual responsible for assessment report	Expected review completion date
1	Spring 2022	lab activity	geology faculty		f.t. geologist	June 2022
2	Spring 2022	lab activity	geology faculty	geologic samples	f.t. geologist	June 2022
3	Spring 2023	lab activity	geology faculty	topographic + geologic maps	f.t. geologist	June 2023
4	Spring 2023	exam	geology faculty		f.t. geologist	June 2023
5	Spring 2024	writing assignment	geology faculty	journal article	f.t. geologist	June 2024

Dissemination of Information (Geology)

Results will be shared in a special department meeting once a year. This will occur near the end of the academic year as soon as exam data for the year are available. In addition, written summaries will be shared with the Learning Outcomes and Assessment Committee, the dean, and the Vice President, Academic Affairs.

Mission (Physical Science)

The mission of the Physical Science program is to guide students in developing an understanding of the fundamental processes of the physical world, their systematic study through observation and experiment, and their use in developing models for the evolution of the Earth and Universe.

Program Outcomes (Physical Science)

1. PHSC PSLO 1 - Carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.
2. PHSC PSLO 2 - Describe the methods and standards of science and the fundamental principles that govern the universe.
3. PHSC PSLO 3 - Give examples of processes which illustrate the application of a major scientific principle.
4. PHSC PSLO 4 - Identify a variety of geological specimens (e.g., rocks, minerals, fossils) and interpret geologic data (rocks, maps, cross sections, etc.), both in terms of plate tectonic theory.
5. PHSC PSLO 5 - State the major scientific principles in both verbal and in simplified mathematical form.

Course/Program Alignment (Physical Science)

Outcomes will be introduced, developed and practiced with feedback, and demonstrated at their highest levels as shown below. (Key: I= Introduced; D=Developed and practiced with feedback; and M=Demonstrated at a specified mastery level). Note: The courses

currently offered in the Physical Sciences program are *Matter, Energy, and Molecules* (PHSC 111) and *Earth and Universe* (PHSC 112), so completion of the PSLOs is linked to these two courses.

	Outcome				
Course	1	2	3	4	5
PHSC 111	I, D	I, D	I, D		I, D
PHSC 112	I, D	I, D	I, D	I, D	I, D

Implementation of Assessment (Physical Science)

Responsibility for implementing the assessment lies with the entire department. Confident that outcomes are reflected in actual coursework of your major/program, describe the mechanisms for assessment. Think of assessing your outcomes on a 4 or 5 year cycle.

PSLO	Semester assessed	Assessment method	Team to review assessment results	Resources needed to conduct assessment	Individual responsible for assessment report	Expected review completion date
1	Spring 2020	lab activity	physical science faculty	lab equipment	f.t. physical scientist	June 2020
2	Spring 2021	exam	physical science faculty		f.t. physical scientist	June 2021
3	Spring 2022	exam	physical science faculty		f.t. physical scientist	June 2022
4	Spring 2023	lab activity	physical science faculty	geologic samples + maps	f.t. physical scientist	June 2023
5	Spring 2024	exam	physical science faculty		f.t. physical scientist	June 2024

Dissemination of Information (Physical Science)

Results will be shared in a special department meeting once a year. This will occur near the end of the academic year as soon as exam data for the year are available. In addition, written summaries will be shared with the Learning Outcomes and Assessment Committee, the dean, and the Vice President, Academic Affairs.

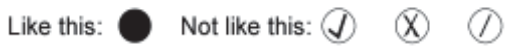
Section 4: Student Data Collection

For the last complete program review (2007-2008) the geology instructor used the standard student survey (below) without modification. In light of changes to the program proposed in conjunction with the current program review, however, future surveys might benefit from including questions that assess student interest in: (1) the Geology major once an AS-T degree is available; (2) having at least one Geology class taught via Distance Learning (online or hybrid); and (3) developing possible alternative classes in Physical Science to meet the needs of aspiring teachers and general education students.

PROGRAM REVIEW
Student Survey

Please answer the following questions as they pertain to your experience in this course and all other courses in
Geology or **Physical Science** . Note: Questions below are formatted for Geology.

Please indicate how satisfied you are, in general, with the following aspects of your Geology course.
Please fill in the bubbles completely with a pen or pencil.



	Highly Satisfied	Moderately Satisfied	Satisfied	Moderately Dissatisfied	Highly Dissatisfied	No Opinion
1. Quality of instruction within the program	1	2	3	4	5	0
2. The way textbooks and other materials used in courses within the program help me learn	1	2	3	4	5	0
3. Advice about the program from counselors	1	2	3	4	5	0
4. The way this program meets your educational goals	1	2	3	4	5	0
5. Contribution towards your intellectual growth	1	2	3	4	5	0
6. Clarity of course goals and learning objectives	1	2	3	4	5	0
7. Feedback and assessment of progress towards learning objectives	1	2	3	4	5	0
8. The availability of courses offered in the program	1	2	3	4	5	0
9. The content of courses offered in **Geology**	1	2	3	4	5	0
10. The coordination of courses offered in **Geology** and courses offered in other departments that may be required for your major	1	2	3	4	5	0
11. The physical facilities and space (e.g., classrooms, labs)	1	2	3	4	5	0
12. Instructional equipment (e.g., computers, lab equipment)	1	2	3	4	5	0
13. Presentation of classes via the college's Blackboard course management system	1	2	3	4	5	0
14. Course assistance through tutorial services (e.g. through the Tutorial Center, Math Lab, Writing Center)	1	2	3	4	5	0
15. Availability of appropriate resources in the libraries	1	2	3	4	5	0

OPTIONAL QUESTIONS:

1. Which of the following best describes your reason for taking this and other courses in **Geology**?

   o Recommended by a counselor
   o Recommended by a friend
   o Other
   o To meet general education requirements
   o Offered at a convenient time

1. Compared to the beginning of the semester, your attitude about **Geology** has

   o Improved o Remained the same o Decreased

2. I would recommend taking courses in **Geology**

   o Strongly Agree o Agree o Uncertain o Disagree o Strongly Disagree

4. I plan on taking additional courses in **Geology**.

   o Strongly Agree o Agree o Uncertain o Disagree o Strongly Disagree

5. Which of the following courses have you taken in **Geology**?

   A. GEOL 100 (Physical Geology + lab)
   B. GEOL 111 (Historical Geology + lab)
   C. GEOL 114 (Oceanography)
   D. GEOL 131 (Geology of California)
   E. GEOL 141 (Environmental Geology)
   F. Other GEOL (e.g. GEOL 199A: Geology of California's Deserts)

6. In which of the following courses are you currently enrolled?

   A. GEOL 100 (Physical Geology + lab)
   B. GEOL 111 (Historical Geology + lab)
   C. GEOL 114 (Oceanography)
   D. GEOL 131 (Geology of California)
   E. GEOL 141 (Environmental Geology)
   F. Other GEOL (e.g. GEOL 199A: Geology of California's Deserts)

Background Questions

1. How many units have you completed prior to this semester?

   o 0-15
   o 16-30
   o 31-45
   o 46-60
   o 61 or more

2. In how many units are you currently enrolled?

   o less than 5 o 5 to 8.5 o 9 to 11.5 o 12 or more

3. What is your final academic goal?

   o Certificate
   o AA/AS
   o Bachelors
   o Masters or higher
   o Not certain

Section 5: Institutional Directions, Goals, and Objectives

The College's strategic plan is available on the Portal.

Section 6: Plan of Action, Pre-Validation

Based on interpretations of the data that take into account different program faculty perspectives within the program and constraints on available resources, what changes do you propose?

PLAN OF ACTION - PRE-VALIDATION
Six Year

DEPARTMENT: Life and Physical Sciences PROGRAM: Geology and Physical Science

List below as specifically as possible the actions which the department plans to take as a result of this program review. Be sure to address any problem areas which you have discovered in your analysis of the program. Number each element of your plans separately and for each, please include a target date. Additionally, indicate by the number each institutional goal and objective which is addressed by each action plan. (See Institutional Goals and Objective.

RECOMMENDATIONS TO IMPROVE **STUDENT LEARNING OUTCOMES** AND ACHIEVMENT	Goal from Strategic Plan	Target Date
1. Add a lab component to one of the existing non-lab Geology courses, such as Oceanography or Environmental Geology. This change is supported by PSLO data which indicate that students are more likely to meet or exceed standards for outcomes that are supported by laboratory or field activities. (Note: If Historical Geology is added to the curriculum (below) it would add a second lab; this change would add a third.)	1. SLS6	1. Develop lab component 2020-2021; begin offering 2021-2022.
2. Develop a plan to offer student internships with local environmental consulting firms and related businesses after soliciting opinions from local employers (oil companies, U.S. Geological Survey, consulting firms, etc.) about the skills needed for Earth science jobs and incorporating this information would into the Geology/Physical Science curriculum. Internships are one important tool for engaging students and preparing them for careers in the sciences (e.g. Phys21).	2. E1	2. New faculty member meets with local employers 2021-2022; develops and begins offering internships 2022-2023 and beyond.

RECOMMENDATIONS TO ACCOMMODATE CHANGES IN **STUDENT CHARACTERISTICS**	Goal from Strategic Plan	Target Date
Enrollment Changes 1. Investigate developing a new course or courses in Physical Science to accommodate increased demand for PHSC courses by science teachers.	1. SLS6	1. Research new course 2020-2021; create 2021-2022.
2. Revise the course outline of one of the existing non-lab Geology courses (e.g. Oceanography, Environmental Geology) to adapt it for distance learning.	2. SLS2	2. New faculty member adapts Oceanography for distance learning 2021-2022, begins offering online in 2022-2023.
Demographic Changes 1. Increase involvement in the MESA program to address deficiencies in the number of underrepresented groups earning degrees in the Earth Sciences. This goal, continued from the previous program review, remains relevant to address the percentages of women and ethnic minorities earning geoscience degrees today.	1. SLS2, SLS5	2. Fall 2020.

RECOMMENDATIONS TO IMPROVE THE **EDUCATIONAL ENVIRONMENT**	Goal from Strategic Plan	Target Date
Curricular Changes 1. Develop a Historical Geology course in order to enable the Geology program (1) to offer a second lab class to serve both majors and general education students and (2) award an AS-T degree in Geology.	1. SLS6	1. Develop and review course in 2020-2021 so that it could be offered beginning spring 2022.
Co-Curricular Changes		
Neighboring College and University Plans 1. Create an AS-T degree in Geology. The option of a Geology degree holds promise for attracting additional students to the program and facilitating their transfer to university and 4-year college degree programs by enabling them to complete their degree preparation at AHC.	1. SLS2, SLS6	1. Submit proposal to curriculum committee fall 2020; offer degree 2021 or 2022.
Related Community Plans 1. Develop and offer a Life and Physical Sciences speaker series with monthly presentations for interested members of the community by faculty or students that explore current topics in science or the results of student or faculty research.	1. SLS8	1. Plan speaker series fall 2020; presentations begin spring 2021.

RECOMMENDATIONS THAT REQUIRE **ADDITIONAL RESOURCES**	Goal from Strategic Plan	Target Date
Facilities		
Equipment 1. Purchase a 32-passenger bus or two vans to transport students on geology field trips for regional (GEOL 199) and other (e.g. Oceanography, Physical Geology) courses. Field trips are a unique part of Geology courses and an important tool for recruiting new students into the program. *Budget priority 3.* 2. Developing and offering a Historical Geology course would require a one-time purchase of some new lab samples (e.g. fossils, sedimentary structures), maps, etc. *Budget priority 2.* 3. Purchase twelve up-to-date GPS receivers and a site license for Arc GIS in order to introduce students to these widely-used technologies in existing courses. *Budget priority 4 (lowest).*	1. SLS2 2. SLS2 3. IR3	1. Add to the proposed budget in 2020-2021; purchase and have in service for 2021-2022 trips. 2. Develop course and budget materials in 2020-2021; purchase materials in fall 2021 so that course could be offered spring 2022. 3. Propose in 2020-2021 budget and, if funded, purchase and add to the courses in 2021-2022.
Staffing 1. Hire a new full-time faculty member to assume responsibility for the Geology program, replacing the instructor who passed away recently. This faculty member would teach Geology and Physical Science courses and concentrate on improving the Geology Program by, for example, adding Historical Geology, creating the Geology AS-T degree, and converting at least one geology course (e.g., Oceanography) to distance learning to better serve students. *Budget priority 1 (highest).*	1. IR1	1. Hire during 2020-2021 with fall 2021 start date.

Section 7: Validation Procedures

The validation team consisted of Sean Abel, William Hirt, Feride Schroeder, Vince Tobin, and Ashley Wise. Team members reviewed the draft Geology/Physical Science PR and discussed clarifications and revisions for about two hours (2 PM till 4 PM) on Friday, October 16, 2020. Sean Abel drafted a summary of the team's major findings and recommendations which team members then reviewed and signed (below). Finally, William Hirt updated the draft program review to reflect the team's recommendations.

Section 8: Executive Summary and Plan of Action, Post-Validation

Executive Summary

The executive summary is attached below and includes: (1) major findings of program strengths and concerns; (2) recommendations; and (3) the signatures of the validation team members.

Plan of Action, Post-Validation

The Plan of Action—Post Validation is modified from Section 6 to incorporate the recommendations from the validation team as appropriate.

Section 9: Evaluation of Process

Level of participation: William Hirt, a retired geology instructor from College of the Siskiyous, wrote this program review in consultation with the following AHC faculty: Feride Schroeder (part-time geology instructor), Vince Tobin (outgoing Life and Physical Science Department chair), and Ashley Wise (incoming Life and Physical Science Department chair) and with assistance from Sean Abel (Dean of Academic Affairs).

Suggestions for improvement of the evaluation process:

1. Clarify the difference between what the template is asking for in Sections 2.VIII and 6. Both ask the program faculty to look ahead, propose goals for the next 5 years and then lay out timelines to implement them. Section 2.VIII asks for training or resources needed to implement long-term goals whereas Section 6 asks that the goals reference relevant parts of the College's strategic plan but, otherwise, both sections seem to be similar.
2. Clarify what the template is asking for in Section 5. Does this section serve to provide a link to AHC's strategic plan so that relevant Themes/Objectives/Strategies can be referenced in Section 6 or is something else being requested?

Section 10: Annual Update

The form for the Annual Update is attached below.

PROGRAM REVIEW -- VALIDATION TEAM MEMBERS

TO: Academic Dean Date: 9/10/2020

From: Ashley Wise

We recommend the following persons for consideration for the validation team:

DEPARTMENT Life and Physical Sciences PROGRAM Geology/Physical Science

Board Policy requires that the validation team be comprised of the dean of the area, one faculty member from a related discipline/program, and two faculty members from unrelated disciplines.

Feride Schroeder	Geology
(Name)	(Related Discipline/Program)
Vince Tobin	Physics
(Name)	(Unrelated Discipline/Program)
Ashley Wise	Biology
(Name)	(Unrelated Discipline/Program)

At the option of the self-study team, the validation team may also include one or more of the following: a. someone from a four-year institution in the same discipline; someone from another community college in the same discipline; a high school instructor in the same discipline; a member of an advisory committee for the program. Please complete the following as relevant to your program review.

Hirt, William _____
(Name) (Title)

Affiliation: _____ Telephone Contact Number: (530) 938-1442

Address 289 Oregon Street, Weed, CA 96094 hirt@snowcrest.net
(Mailing) City/State/Zip email address

_____ _____
(Name) (Title)

Affiliation: _____ Telephone Contact Number: _____

Address _____
(Mailing) City/State/Zip email address

_____ _____
(Name) (Title)

Affiliation: _____ Telephone Contact Number: _____

Address _____
(Mailing) City/State/Zip email address

APPROVED: _____ 9/15/2020
Academic Dean Date

EXECUTIVE SUMMARY
(Validation Team Report)

The Validation Team for the 2020 Geology/Physical Science six-year program review—consisting of Geology part-time faculty member Feride Schroeder, Physics/Astronomy faculty member Vincent Tobin, Biology faculty member Ashley Wise, author of the Program Review and retired Geology faculty member William Hirt from College of the Siskiyous in Weed, CA and Dean Sean J. Abel—met to review and discuss the comprehensive program review for approximately 105 minutes on Friday October 16, 2020. It was clear that each member of the team had reviewed the document with care and came prepared to provide feedback and suggestions to the document's author, William Hirt.

1. MAJOR FINDINGS

Strengths of the program/discipline:

The team members were impressed with the attention to detail, consideration, and thought that was evident throughout the document. The team was able to clarify a few items for the author and offered to email editorial remarks, such as typographical errors, so that we could focus on the impact of the document to the program.

As the team reviewed the document together, they commented on the strong tradition of Geology and Physical Science as general education courses in meeting student need in highly satisfactory manner. Field courses in both disciplines were mentioned as a significant part of the educational program at the college. The report and the team discussed a very positive employment outlook for students attaining four year and graduate degrees in Geology and Physical Sciences. This has been particularly emphasized due to climate change and the resultant effects on every region of the Earth.

Geology and Physical Science are fortunate to have a dedicated lab space and excellent facilities. The programs are well supported by the Life and Physical Sciences Department as well as the Dean. Faculty teaching the various courses discussed in the report are well-qualified and passionate.

Concerns regarding the program/discipline:

A significant portion of the discussion focused on the challenges the Geology program has faced following the long-term illness and then loss of the full-time faculty member just a few years ago. This loss has created a lack of focus in the program, a need to update curriculum which includes the addition of a new course, broadening modalities to include online offerings when appropriate, a new lab class for Oceanography, and the creation of and Associate Degree for Transfer in Geology. Other concerns included the inability to offer the Geology Field Courses, the Physical Science Field Courses, and a need for better connections with the MESA program for students with a Geology/Physical Science focus. This last concern may be ameliorated with the creation of the transfer degree.

2. RECOMMENDATIONS

Many of the recommendations described in this Program Review were established a number of years ago, the last time a Comprehensive Program Review was completed. Team members believe a critical recommendation is to immediately begin the hiring process to fill the long-empty full-time faculty position. This is an imperative step to take as that individual will be able to guide the program in fulfillment of the initiatives discussed herein. It is the belief of the members of the Validation Team that a majority of these initiatives cannot be attained without a full-time Geology faculty member.

Summary prepared by Sean J. Abel,

Dean, Academic Affairs

VALIDATION TEAM SIGNATURE PAGE

Vince Tobin

Feride Schroeder Feride Schroeder (Jan 15, 2021 14:48 PST) Jan 15, 2021

Ashley Wise Ashley Wise (Jan 15, 2021 15:52 PST) Jan 15, 2021

Sean J. Abel (Jan 15, 2021 16:02 PST) Jan 15, 2021

PLAN OF ACTION – POST-VALIDATION Six Year

DEPARTMENT: Life and Physical Sciences PROGRAM: Geology and Physical Science

List below as specifically as possible the actions which the department plans to take as a result of this program review. Be sure to address any problem areas which you have discovered in your analysis of the program. Number each element of your plans separately and for each, please include a target date. Additionally, indicate by the number each institutional goal and objective which is addressed by each action plan. (See Institutional Goals and Objectives.)

RECOMMENDATIONS TO IMPROVE **STUDENT LEARNING OUTCOMES** AND ACHIEVEMENT	Goal from Strategic Plan	Target Date
1. Add full lab components to the existing Oceanography or Environmental Geology courses. This change is supported by PSLO data which indicate that students are more likely to meet or exceed standards for outcomes that are supported by laboratory or field activities. (Note: If Historical Geology is added to the curriculum (below) it would add a second lab to the Geology program; this recommendation would add additional labs.)	1. SLS6	1. Develop lab components 2020-2021; begin offering 2021-2022.
2. Develop a plan to offer student internships with local environmental consulting firms and related businesses after soliciting opinions from local employers (oil companies, U.S. Geological Survey, consulting firms, etc.) about the skills needed for Earth science jobs and incorporating this information into the Geology/Physical Science curriculum. Internships are one important tool for engaging students and preparing them for careers in the sciences (e.g. Phys21).	2. E1	2. New faculty member meets with local employers 2022-2023; modifies CORs 2023-2024, and begins offering internships 2024-2025 and beyond.

RECOMMENDATIONS TO ACCOMMODATE CHANGES IN **STUDENT CHARACTERISTICS**	Goal from Strategic Plan	Target Date
Enrollment Changes 1. Investigate developing a new course or courses in Physical Science to accommodate increased demand for PHSC courses by teachers.	1. SLS6	1. Research new course 2020-2021; create 2021-2022.
2. Revise the course outline of Oceanography or Environmental Geology to adapt it for distance learning.	2. SLS2	2. New faculty member adapts Oceanography for distance learning 2021-2022, begins offering online in 2022-2023.
Demographic Changes 1. Increase involvement in the MESA program to address deficiencies in the number of underrepresented groups earning degrees in the Earth Sciences. This goal, continued from the previous program review, remains relevant to address the percentages of women and ethnic minorities earning geoscience degrees today.	1. SLS2, SLS5	2. Goal likely to be more attainable once AS-T degree in Geology is available beginning 2022-2023.

RECOMMENDATIONS TO IMPROVE THE **EDUCATIONAL ENVIRONMENT**	Goal from Strategic Plan	Target Date
Curricular Changes 1. Develop a Historical Geology course in order to enable the Geology program (1) to offer a second lab class that will serve both majors and general education students and (2) award an AS-T degree in Geology.	1. SLS6	1. Develop and review course during 2021-2022 so that it could be offered beginning fall 2023 or spring 2024.
Co-Curricular Changes		
Neighboring College and University Plans 1. Create an AS-T degree in Geology. The option of a Geology degree holds promise for attracting additional students to the program and facilitating their transfer to university and 4-year college degree programs by enabling them to complete their degree preparation at AHC.	1. SLS2, SLS6	1. Submit proposal to curriculum committee 2021-2022; offer degree 2023-2024.
Related Community Plans 1. Develop and offer a Life and Physical Sciences speaker series with monthly presentations for interested members of the community by faculty or students that explore current topics in science or the results of student or faculty research.	1. SLS8	1. Plan speaker series fall 2021; presentations begin spring 2022.

RECOMMENDATIONS THAT REQUIRE **ADDITIONAL RESOURCES**	Goal from Strategic Plan	Target Date
Facilities		
Equipment 1. Purchase two or three vans to transport students on geology field trips for regional (GEOL 199 and PHSC 199) and other (e.g. Oceanography, Physical Geology) courses. Field trips are a unique part of Geology courses and an important tool for recruiting new students into the program. *Budget priority 3.* 2. Developing and offering a Historical Geology course would require a one-time purchase of some new lab samples (e.g. fossils, sedimentary structures), maps, etc. *Budget priority 2.* 3. Purchase a site license for ArcGIS and twelve compatible laptops to introduce students to this widely used software in existing courses. *Budget priority 4 (lowest).*	1. SLS2 2. SLS2 3. IR3	1. Add to the proposed budget in 2021-2022; purchase and have in service for 2022-2023 trips. 2. Develop course and budget materials in 2021-2022; purchase materials in 2022-2023 so that course could be offered in 2023-2024. 3. Propose in 2021-2022 budget and, if funded, purchase and add to the courses in 2022-2023.
Staffing 1. Hire a new full-time faculty member to assume responsibility for the Geology program, replacing the instructor who passed away recently. This faculty member would teach Geology and Physical Science courses and concentrate on improving the Geology Program by, for example, adding Historical Geology, creating the Geology AS-T degree, and converting at least one geology course (e.g., Oceanography) to distance learning to better serve students. *Budget priority 1 (highest).*	1. IR1	1. Hire during 2020-2021 with fall 2021 start date.

PLAN OF ACTION – Post-Validation

Review and Approval

Plan Prepared By

Vince Tobin Date:

Date:

William Hirt Date: 14-Nov-2020

Date:

Reviewed:

Department Chair* Ashley Wise Date: 11/14/2020

Ashley Wise

*Signature of Department Chair indicates approval by department of Plan of Action.

Reviewed:

Dean of Academic Affairs Date: 1/13/2021

Sean Abel

Vice President, Academic Affairs

Robert Curry (Jan 15, 2021 15:05 PST) Date: Jan 15, 2021

Robert Curry

Signature: 
William Hirt (Oct 21, 2020 11:27 PDT)

Email: hirt@snowcrest.net

Pages from Geology and Physical Science PR Hirt 3Nov20f

Final Audit Report 2021-01-15

Created:	2021-01-15
By:	Lisa Gutierrez (lisa.gutierrez@hancockcollege.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAA5KSTaXlhCJyxGY9u8JGWzbBhpJHk7k5E

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Instructional Program Review – Annual Update
2020

Date:	
Program and Department:	Administration of Justice
CTE Program?	☐ Yes ☐ No
Additional programs included in this review:	
Date of last comprehensive review:	
Submitted By:	
Attachments (* as needed):	☐ 6-year assessment plan – All programs, when applicable ☐ 2-year scheduling plan ☐ Justification for Resource Requests (if needed)

I. Alignment of the Program with the AHC Mission

AHC Mission: Allan Hancock College provides quality educational opportunities that enhance student learning and the creative, intellectual, cultural, and economic vitality of our diverse community.

a. Have there been any changes that would require a change to your Program Mission?

b. Explain how your program mission aligns with the college mission.

The college mission and values can be found here:
http://www.hancockcollege.edu/public_affairs/mission.php

II. Student Success, Program Accessibility and Program Capacity

*NO data analysis required this year.

a. Describe how the program works to promote student success (completions job placement, transfer). Include teaching innovations and use of academic and student support.

b. List any notable accomplishments of the program (student awards, honors, or scholarships can be listed here also)

III. Quality and Innovation in the Program and Curriculum Review

a. Are you on track in your assessment plan for course and program SLOs? If not, please explain why.

b. Have you shared your assessments or improvement plans with your department, program or advisory committee? If so, what actions resulted? If not, how do you plan to do so in the future?

c. Did any of section, course or program improvement plans indicate that your program would benefit from specific resources in order to support student learning and/or faculty development? If so, please explain.

d. In reviewing your outcomes and assessments have you identified any and all that indicate a modification should be made to the course outline, the student learning outcomes or the program outcomes? Please state what modifications you will be making.

e. Have all course outlines been reviewed within the last 5 years? If not, please explain the plan to bring course outlines up to date and include timelines for the review and submission to AP&P.

f. For **CTE courses/programs only**, as per §55003, have prerequisites, corequisites and advisories (PCAs) for courses and/or programs been reviewed within the last 2 years?

IV. Focus and Engagement of the Program

a. Summarize major trends and opportunities as well as challenges that have emerged in the program

b. List any (internal or external) conditions that have influenced the program in the past year.

Data for Program with Vocational TOP Codes (CTE):
http://www.hancockcollege.edu/institutional_effectiveness/reports.php
Please review the data and comment on any trends.

c. Current industry employment and wage data (please cite sources)

d. Industry employment and wage trends

e. TOP code employment CORE indicator report

f. Advisory committee recommendations

V. Continuous Improvement of the Program

a. Status of Final Plan of Action – Post Validation
Summarize the progress made on the recommendations from your last comprehensive program review plan of action

PLAN OF ACTION	ACTION TAKEN/RESULT AND STATUS

b. List any new resources that the program received in the past year and the results

Source	Specific Resource	Est. Amount $	Impact on program or course outcomes

c. List any new or modified recommendations below, including rationale for these in the table.

Program Improvement Plan (Program ,Priority Number, year)	Anticipated Outcome (Goal)	Program Goal Status (Indicate if this goal is ongoing from a previous Annual Or Comprehensive Program Review or new this year).	Alignment to Strategic Directions and planning goals (see " Alignment to Strategic Directions" Attached	Activities	Justification (Evidence of need)	Resource Request (From table Below)	Anticipated Completion Date or On-going

d. Summary of request for resources. Please list the type of request (facility, technology, staffing, equipment, other) and rank their priority.

Resource Requests	Item	Program Goal	Type	One-time cost	On-going cost (per fiscal year)	Anticipated Completion Date or On-going

(Program, RRX year)						

Allan Hancock College
2013-2019 Geology/Physical Science Program Review

Appendices:

A. **Revised Course Outlines:**
    a. Text highlighted in blue is newly added whereas that in black is taken from the older course outlines.
    b. Revisions were proposed for the Geology independent study (GEOL 189) and field courses (GEOL 199A-D) as part of this review. Revisions were not proposed, however, for the similar Physical Science field courses PHSC 199A-H.
B. **Associate of Science for Transfer Degree proposal for Geology:**
    a. First section (3 pages) is modified from the Geology AS-T framework provided by the Articulation Officer to include the new Historical Geology course (GEOL 111).
    b. Second section (2 pages) provides text that can serve as a starting point for writing the catalog description for the new AS-T degree in Geology.
C. **Proposed Guided Pathways Schedule for Geology AS-T degree**
    a. One possible sequence of courses consistent with the CSU requirements and AHC's offerings.

Board Approval: x-x-xxxx
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 100
Catalog Course Title: Physical Geology
Banner Course Title: Physical Geology

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	6.0	96.0 – 108.0	4.0
Total Contact Hours	6.0	96.0 – 108.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisories

ENGL 101 Freshman Composition: Exposition

and

MATH 311 Algebra 1

Entrance Skills

Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- Learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- Think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.
- Improve writing skills and techniques.

- Effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- Conduct research effectively, including investigation, collection, evaluation, and documentation, and presenting the findings in acceptable written form.
- Access and use information ethically and effectively.
- Identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.
- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

Catalog Description

Physical Geology explores the processes that are shaping Earth today. It examines the formation of rocks and mineral resources, the volcanic and tectonic activity that accompany release of Earth's internal heat, and the sculpting of the planet's surface that occurs as air, water and ice move in response to gravity and energy from the Sun. Lab activities include identification of rocks and minerals, interpretation of topographic and geologic maps, and field studies of regional geologic features.

Course Content

Lecture Content

1. Introduction to geology
   1.1. Scientific method
   1.2. History of geology
2. Earth materials
   2.1. Minerals
   2.2. Igneous, sedimentary, and metamorphic rocks
3. Geologic time and Earth history
   3.1. Geologic time
   3.2. Relative and absolute dating
   3.3. Fossils and fossilization
4. Earth's internal forces
   4.1. Plate tectonics
   4.2. Earthquakes
   4.3. Volcanism and igneous processes
   4.4. Mountain building
   4.5. Geological structures
   4.6. Metamorphism and metamorphic Rocks

5. Earth's external processes
    5.1. Weathering
    5.2. Soils
    5.3. Mass wasting and erosion
    5.4. Sediments and sedimentary rocks
    5.5. Surface water processes
    5.6. Groundwater processes
    5.7. Oceans and coastal processes
    5.8. Desert processes
    5.9. Glacial processes
6. Renewable and non-renewable resources
    6.1. Metallogenic provinces

Laboratory Content

1. Topographic maps
2. Mineral identification
3. Relative and absolute dating
4. Geologic time
5. Plate tectonics
6. Earthquakes
7. Volcanoes
8. Rock identification
9. Geological structures
10. Geological maps and cross sections
11. Surface water processes
12. Groundwater processes
13. Coastal processes
14. Desert processes
15. Glacial processes
16. Field Trips

Course Objectives

At the end of the course, the student will be able to:

1. Identify a variety of common rocks and minerals and explain what each tells us about the geologic processes that produced it.
2. Establish the timing of the geologic events that have shaped a region, as depicted on a geologic map or cross-section, by applying relative and absolute dating principles.
3. Distinguish the three types of boundaries that separate Earth's lithosphere plates and explain how the stress at each is related to the deformation, seismicity, and volcanism observed there.
4. Explain how the contrasting properties of different parts of Earth's interior have enabled us to map the planet's internal structure and link processes there to those occurring at the surface.
5. Recognize common landforms from their depictions on topographic maps and analyze how each is formed through interactions between constructional processes and erosion caused by the movements of water, wind, and ice.

6. Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate your analysis to others.

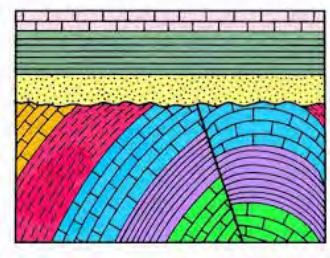
Methods of Instruction

1. Lecture
2. Visiting Lecturers
3. Lab activities
4. Field Trips

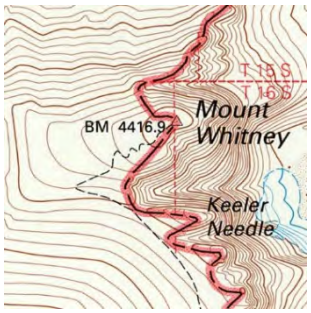
Assignments

1. Daily discussion questions correlated with reading assignments and lectures
2. Weekly guided learning explorations (reviews of basic chapter content from the textbook publisher)
3. Writing assignment: outline, preliminary abstract, and revised abstract of a recent *Scientific American* article (students choose one article from a pair provided to the class)
4. Weekly lab reports

Sample discussion/exam questions:



1. List the five events that have shaped the geology of the area shown in cross-section at right, from oldest (1) to youngest (5).
2. Which two factors control the viscosity of a lava and, thus, strongly influence the type of volcano it will build?
3. Analysis of a crystal reveals that it contains seven times as many atoms of a stable daughter element as of its radioactive parent. If the crystal only contained the parent element when it formed and the half-life of parent-daughter decay is 100 million years, what is the radiometric age of the crystal?



4. The topographic map at right shows the summit of Mount Whitney in the Sierra Nevada. Based on the topographic contours, which side of the mountain is steepest and how did you know?
5. Describe two simple physical tests you could perform to distinguish between samples of calcite and quartz.

Methods of Evaluation

1. Quizzes (discussion questions)
2. Homework (guided learning explorations)
3. Writing assignments
4. Exams (midterms and final)
5. Lab reports

Note: Achievement of objectives is demonstrated by means of written exams and quizzes, writing assignments, and lab reports whose questions and directions require observation, recall of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

Texts and Other Instructional Materials

Adopted Textbook

1. Marshak: *Essentials of Geology*, 6th ed., 2019

Supplemental Textbook

1. None

Instructional Materials

1. Rock and mineral samples; hand lenses; maps; scales, protractors, and drawing compasses; compasses; and other equipment needed to conduct labs.

Student Learning Outcomes

1. GEOL 100 SLO1 - Identify a variety of common rocks and minerals and explain what each tells us about the geologic processes that produced it. [C-ID objectives 5, 6]
2. GEOL 100 SLO2 - Establish the timing of the geologic events that have shaped a region, as depicted on a geologic map or cross-section, by applying relative and absolute dating principles. [C-ID objective 7]
3. GEOL 100 SLO3 - Distinguish the three types of boundaries that separate Earth's lithosphere plates and explain how the stress at each is related to the deformation, seismicity, and volcanism observed there. [C-ID objectives 2, 3]
4. GEOL 100 SLO4 - Explain how the contrasting properties of different parts of Earth's interior have enabled us to map the planet's internal structure and link processes there to those occurring at the surface. [C-ID objective 3, 4]
5. GEOL 100 SLO5 - Recognize common landforms from their depictions on topographic maps and analyze how each is formed through interactions between constructional processes and erosion caused by the movements of water, wind, and ice. [C-ID objectives 7, 9]
6. GEOL 100 SLO6 - Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate your analysis to others. [C-ID objectives 1, 8]

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: x-x-xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 111
Catalog Course Title: Historical Geology
Banner Course Title: Historical Geology

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	6.0	96.0 – 108.0	4.0
Total Contact Hours	6.0	96.0 – 108.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisory
ENGL 101 Freshman Composition: Exposition

and

Advisory
MATH 311 Algebra 1

Entrance Skills
Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition
- Learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- Think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.

- Improve writing skills and techniques.
- Effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- Conduct research effectively, including investigation, collection, evaluation, and documentation, and presenting the findings in acceptable written form.
- Access and use information ethically and effectively.
- Identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.
- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

Catalog Description

Historical Geology explores how Earth and the life it supports have changed through time. Geologic principles are used to reconstruct the planet's origin and the events that have modified the physical environment, whereas fossils are used to trace the history of life and discover how natural selection and environmental change have shaped living communities. Lab exercises include the identification of rocks and fossils, map interpretation, and field study of regional geologic history.

Course Content

Lecture Content

1. Plate Tectonics
    a. Formation and early evolution of the Earth
    b. Plate driving mechanisms
    c. Plate boundaries
    d. Hotspots
    e. Crustal evolution and deformation
    f. Supercontinent cycle
2. Earth's Materials
    a. Minerals
    b. Igneous, sedimentary, and metamorphic rocks
    c. Rock cycle
3. Fossils
    a. Modes of formation
    b. Classification of living organisms
    c. Ecology
    d. Evolution and extinction
4. Dating Methods

a. Geologic time
b. Relative dating
c. Absolute dating
d. Stratigraphy
e. Catastrophism and uniformitarianism
f. Interpretation of sedimentary rock sequences

5. Paleogeography and the history of life
    a. Archean
    b. Proterozoic and Ediacaran geologic and tectonic events
    c. Paleozoic geologic and tectonic events
    d. Mesozoic geologic and tectonic events
    e. Cenozoic geologic and tectonic events
    f. Recent geologic and tectonic events

Laboratory Content

1. Identify rocks and minerals
2. Identify major groups of fossil organisms
3. Recognize modes of fossil preservation
4. Construct and interpret cladograms
5. Interpret geologic maps
6. Interpret geologic cross sections
7. Interpret stratigraphic columns
8. Relative dating and interpretation of sequences of geologic events
9. Absolute dating
10. Paleogeographic reconstructions
11. Field trips

Course Objectives

At the end of the course, the student will be able to:

1. Establish the timing of the geologic events that have shaped a region depicted on a geologic map or cross-section by applying relative and absolute dating principles.
2. Identify a variety of common rocks and minerals and explain what each indicates about the tectonic or depositional setting in which it was formed.
3. Identify a variety of common fossils, describe the place of each in the history of life and explain how fossils, collectively, enable us to assess the roles that natural selection and environmental change have played in shaping life on Earth.
4. Apply principle of actualism to infer past environmental conditions using rock characteristics, stable isotope ratios, seawater Ca/Mg ratios, and similar measurements.
5. Outline the major events that have shaped Earth's history and determine the approximate period depicted by a paleogeographic map during Late Proterozoic or Phanerozoic time.
6. Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others.

Methods of Instruction

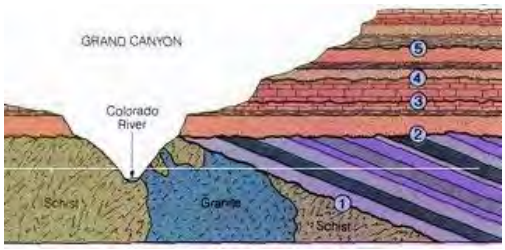
1. Lecture
2. Visiting Lecturers
3. Lab activities
4. Field Trips

Assignments

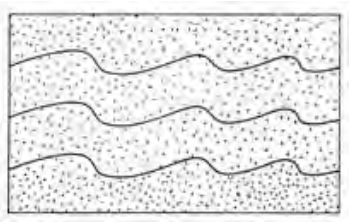
1. Daily discussion questions correlated with reading assignments and lectures
2. Writing assignment: outline, preliminary abstract, and revised abstract of a recent *Scientific American* article (students choose one article from a pair provided to the class)
3. Weekly lab reports

Sample discussion/exam questions:

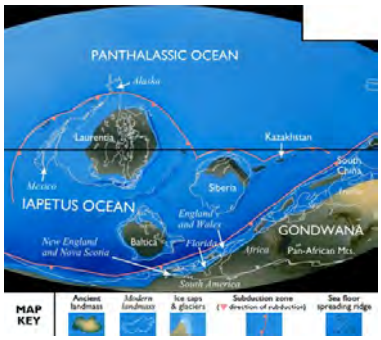
1. Unconformities are surfaces that mark periods of erosion or non-deposition in the rock record. Several are exposed in the Grand Canyon, as indicated by the numbered surfaces in the accompanying cross section. Which specific type of unconformity is number 2, and what sequence of events does it indicate occurred between the deposition of the purple beds and the overlying pink ones?



2. At the end of the Cretaceous period, about 65 million years ago, a mass extinction killed the non-avian dinosaurs and approximately 50% of all genera of marine organisms living at that time. What do geologists conclude caused this mass extinction and what are two lines of evidence they cite to support this conclusion?
3. The accompanying sketch shows asymmetrical ripple marks about 1 cm tall preserved in a sandstone. Are these more likely to have been produced by wave motion or a current and, if by a current, which direction was it flowing? Briefly explain your reasoning.



4. What do homologous organs, like a human's arm, a bat's wing, and a lizard's forelimb, imply about the relationship between these organisms?
5. Analysis of a crystal reveals that it contains fifteen times as many atoms of a stable daughter element as of its radioactive parent. If the crystal only contained the parent element when it formed and the half-life of parent-daughter decay is 200 million years, what is the radiometric age of the crystal?
6. The accompanying paleogeographic map shows ancient North America (Laurentia) sitting astride the equator and surrounded by warm shallow seas in which limy sediments were being deposited. What approximate interval of geologic time (e.g., late Paleozoic, early Mesozoic, etc.) does this map depict?



Methods of Evaluation

1. Quizzes (discussion questions)
2. Writing assignments
3. Exams (midterms and final)
4. Lab reports

Note: Achievement of objectives is demonstrated by means of written exams and quizzes, writing assignments, and lab reports whose questions and directions require observation, recall

of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

Texts and Other Instructional Materials

Adopted Textbook

1. Stanley and Luczaj: *Earth System History*, 4th ed., 2015

Supplemental Textbook

1. None

Instructional Materials

1. Rock, mineral, and fossil samples; hand lenses; maps; scales; and other equipment needed to conduct labs.

Student Learning Outcomes

1. GEOL 111 SLO1 - Establish the timing of the geologic events that have shaped a region depicted on a geologic map or cross-section by applying relative and absolute dating principles. [C-ID objective 6]
2. GEOL 111 SLO2 - Identify a variety of common rocks and minerals and explain what each indicates about the tectonic or depositional setting in which it was formed. [C-ID objective 3]
3. GEOL 111 SLO3 - Identify a variety of common fossils, describe the place of each in the history of life and explain how fossils, collectively, enable us to assess the roles that natural selection and environmental change have played in shaping life on Earth. [C-ID objectives 2, 3]
4. GEOL 111 SLO4 - Apply principle of actualism to infer past environmental conditions using rock characteristics, stable isotope ratios, seawater Ca/Mg ratios, and similar measurements. [C-ID objectives 5, 2]
5. GEOL 111 SLO5 - Outline the major tectonic and geochemical events that have shaped Earth's history and determine the approximate period depicted by a paleogeographic map during Late Proterozoic or Phanerozoic time. [C-ID objectives 2, 4, 5]
6. GEOL 111 SLO6 - Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others. [C-ID objectives 1, 8]

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: x-x-xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 114
Catalog Course Title: Oceanography
Banner Course Title: Oceanography

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	1.000	16.0 - 18.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	4.0	64.0 – 72.0	3.0
Total Contact Hours	4.0	64.0 – 72.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisory
ENGL 101 Freshman Composition: Exposition

and

Advisory
MATH 311 Algebra 1

Entrance Skills
Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- Learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- Think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.

- Improve writing skills and techniques.
- Effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- Conduct research effectively, including investigation, collection, evaluation, and documentation, and presenting the findings in acceptable written form.
- Access and use information ethically and effectively.
- Identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.
- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

Catalog Description

Oceanography introduces the major physical and biological features of Earth's oceans and examines their connections. It explores the geologic processes that shape the ocean basins, the forces that move seawater and influence the planet's climate and coastlines, and the changing physical conditions and selective pressures—including those caused by human activities—that affect the nature and distribution of marine life. Includes field trips to local coastal areas.

Course Content

Lecture Content

1. Introduction
    a. Maps
    b. Scientific method
    c. History of oceanography
2. Chemical and physical properties of seawater
    a. Chemistry of water
    b. Salinity and dissolved gases
    c. SOFAR channel and shadow zone
3. Marine meteorology
    a. Atmosphere and circulation
    b. Fronts, cyclones, and anticyclones
    c. Coriolis force
    d. Sea ice and icebergs
4. Water masses and ocean currents
    a. Coriolis and Eckman transport
    b. Upwelling and downwelling
    c. Major ocean currents (gyres, Gulf Stream, etc.)
    d. Thermohaline circulation

    e. Tidal currents, storm surges, and seiches
5. Estuaries
6. Waves and Tides
    a. Orbital motion
    b. Reflection, refraction, and diffraction
    c. Breakers
    d. Seismic sea waves
    e. Tides
7. Beaches
    a. Longshore transport
    b. Shoreline erosion and deposition
8. Origin and nature of the Earth
    a. Origin of the Earth and its oceans
    b. Earth materials and the rock cycle
    c. Earth's internal structure
    d. Geomagnetism
9. Ocean floor
    a. Shelf, slope, and rise
    b. Ridges and features of specific oceans
    c. Atoll formation
    d. Submarine canyons
10. Plate tectonics and continental drift theory
    a. Paleomagnetism
    b. Earthquakes and plate boundaries
    c. Plate motions past and present
11. Marine sediments
    a. Sediment sources
    b. Terrigenous, and pelagic sediments
    c. Phosphorites, evaporites, and manganese nodules
12. Marine ecosystems and marine life
    a. Photosynthesis and respiration
    b. Nutrients and upwelling
    c. Productivity factors
    d. Plankton, nekton, and benthos

Laboratory Content

1. Field trips

Course Objectives

At the end of the course, the student will be able to:

1. Interpret the origins of geologic features found on the seafloor in terms of the plate tectonic and sedimentary processes operating there.
2. Explain how the structure of the water molecule affects key properties of fresh water (e. g. density, viscosity, specific heat) and how sea salts further modify these properties.
3. Describe how major oceanic circulation patterns are influenced by differences in seawater temperature and salinity, Earth’s rotation, and interactions with the planet’s atmosphere.
4. Explain how waves and tides are generated, move through Earth’s oceans, and interact with continental margins to shape coastlines.

5. Identify a variety of common marine organisms and explain how their features and distributions adapt them to the physical and biological constraints they live under.
6. Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others.

Methods of Instruction

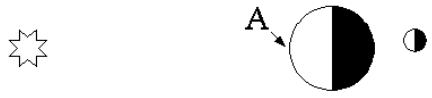
1. Lecture
2. Field trips

Assignments

1. Daily discussion questions correlated with reading assignments and lectures
2. Writing assignment: outline, preliminary abstract, and revised abstract of a recent *Scientific American* article (students choose one article from a pair provided to the class)

Sample discussion/exam questions:

1. The Atlantic Ocean basin began to rift open about 250 million years ago. If the rate of opening has remained constant at 4 cm/yr what do you estimate the width of the ocean basin would be today, rounded to the nearest whole kilometer?
2. What two values do we need to know to calculate the residence time of a conservative ion like Na^+ in seawater? Why doesn't a calculation like this work for a nonconservative ion like PO_4^{3+} or NO_3^-?
3. Out in the open ocean a swell has a wavelength of 60 m. At what depth will this swell "touch bottom" and how will its speed change as it approaches shore?
4. Which type of tide, high or low and spring or neap, will people in coastal city A be experiencing when the Earth, Sun, and Moon are positioned as shown in the accompanying diagram?



5. Many fish have "countershaded" bodies, with dark tops and light bellies. How does this coloration help camouflage them from predators?

Note: The field trips provide additional correlated exercises.

Methods of Evaluation

1. Quizzes (discussion questions)
2. Writing assignments
3. Exams (midterms and final)
4. Field trip reports

Note: Achievement of objectives is demonstrated by means of written exams and quizzes, writing assignments, and field trip reports whose questions and directions require observation, recall of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

Texts and Other Instructional Materials

Adopted Textbook

1. Sverdrup and Kudela: *Investigating Oceanography*, 3rd ed., 2020

Supplemental Textbook

1. Parr: *Northern California Tidepools: A guide to intertidal plants and animals from Oregon to the Central Coast*, 2002

Instructional Materials

1. None

Student Learning Outcomes

1. GEOL114 SLO1 - Interpret the origins of geologic features found on the seafloor in terms of the plate tectonic and sedimentary processes operating there.
2. GEOL114 SLO2 - Explain how the structure of the water molecule affects key properties of fresh water (e.g. density, viscosity, specific heat) and how sea salts further modify these properties.
3. GEOL114 SLO3 - Describe how major oceanic circulation patterns are influenced by differences in seawater temperature and salinity, Earth's rotation, and interactions with the planet's atmosphere.
4. GEOL114 SLO4 - Explain how waves and tides are generated, move through Earth's oceans, and interact with continental margins to shape coastlines.
5. GEOL114 SLO5 - Identify a variety of common marine organisms and explain how their features and distributions adapt them to the physical and biological constraints they live under.
6. GEOL114 SLO6 - Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: xx-xx-xxxx
PCA Established: xx-xx-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: x-x-xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 131
Catalog Course Title: Geology of California
Banner Course Title: Geology of California

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	0.000	0.0 - 0.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	3.0	48.0 – 54.0	3.0
Total Contact Hours	3.0	48.0 – 54.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisory
ENGL 101 Freshman Composition: Exposition

and

Advisory
MATH 311 Algebra 1

Entrance Skills
Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- Learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- Think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.
- Improve writing skills and techniques.

- Effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- Conduct research effectively, including investigation, collection, evaluation, and documentation, and presenting the findings in acceptable written form.
- Access and use information ethically and effectively.
- Identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.
- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

Catalog Description

Geology of California introduces plate tectonics, geologic dating, and the formation of earth materials and then applies these concepts to explore how the state's landscape has been shaped by a wide range of geologic processes during the past two billion years. It also examines the roles that these processes have played in producing California's mineral resources and creating the geologic hazards that confront so many of the state's citizens today.

Course Content

Lecture Content

1. Geologic evolution of California
    a. Modern geomorphology
    b. Plate boundaries
    c. Terrane accretion
    d. Volcanism
2. Earth materials
    a. Rocks and minerals
    b. Mineral and energy resources
    c. Water resources
3. Geologic history of California
    a. Interpreting geologic maps and cross sections
    b. Relative dating principles
    c. Absolute dating principles
    d. Fossils
    e. Geologic evolution of California
4. Physiographic Provinces of California
    a. Cascades
    b. Modoc Plateau
    c. Basin and Range

    d. Sierra Nevada
    e. Klamath Mountains
    f. Great Valley
    g. Coast Ranges
    h. Transverse Ranges
    i. Peninsular Ranges
    j. California coast
5. Faults and Seismicity
    a. Measuring earthquake location and magnitude
    b. Faulting and paleoseismicity
    c. San Andreas and other fault systems in California

Course Objectives

At the end of the course, the student will be able to:

1. Locate the four plate boundaries that occur in and near California today and explain how the seismicity and volcanism associated with each is related to the geologic processes that occur there.
2. Identify common rocks and minerals found in California, including those of economic value, and explain what they tell us about regional geologic processes.
3. Establish timing of geologic events that have shaped a part of California, as depicted in a geologic map or cross-section, by applying relative and absolute dating principles.
4. Recognize landscapes typical of each of California's geomorphic provinces and explain how these landscapes and the potential hazards they pose have been shaped by the unique rock types or processes found in each province.
5. Outline California's geologic history and describe how the state's transition from an ancient rifted margin to a modern active one is reflected in its current geology and topography.
6. Analyze whether an observation, experimental result, or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others.

Methods of Instruction

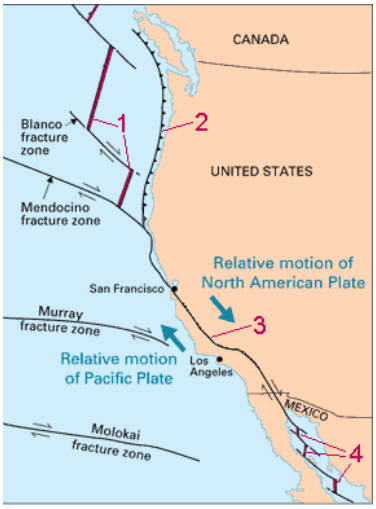
1. Lecture
2. Visiting lecturers

Assignments

1. Daily discussion questions correlated with reading assignments and lectures
2. Writing assignment: outline, preliminary abstract, and revised abstract of a recent *Scientific American* article (students choose one article from a pair provided to the class)

Sample discussion/exam questions:

1. California lies on or near four modern plate boundaries. What are the names of the boundaries labeled 1, 2, 3, and 4 on the accompanying map and which type of boundary (divergent, convergent, or shear) is each?
2. Today the lavas of the Pinnacles-Neenach volcanic field, which were erupted 23.5 million years ago, are found as outcrops on opposite sides of the San Andreas fault separated by 315 km. What average displacement rate is implied for the fault based on the offset of these lavas and is it a minimum or maximum rate? Explain briefly.
3. How is blueschist formed and what does the occurrence of this relatively rare rock in California's Coast Range tell us about the tectonic setting of these mountains?
4. Which of California's geomorphic provinces does Santa Maria lie in and how is the geologic structure of this province related to the development of a shear (transform) boundary along the western margin of North America during late Cenozoic time?
5. The earthquake that devastated San Francisco in April 1906 is estimated to have had a magnitude of 8.3. How much energy did this quake release compared to a magnitude 3 quake, which is the smallest that most people feel under normal circumstances?



Methods of Evaluation

1. Quizzes (discussion questions)
2. Writing assignments
3. Exams (midterms and final)

Note: Achievement of objectives is demonstrated by means of written exams and quizzes, writing assignments, and field trip reports whose questions and directions require observation, recall of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

Texts and Other Instructional Materials

Adopted Textbook

1. Prothero: *California's Amazing Geology*, 1st ed., 2016

Supplemental Textbook

1. *Geologic Map of California*, 1:2,500,000, California Geological Survey, 2010

Instructional Materials

1. None

Student Learning Outcomes

1. GEOL131 SLO1 – Locate the four plate boundaries that occur in and near California today and explain how the seismicity and volcanism associated with each is related to the geologic processes that occur there. [C-ID objective 1]
2. GEOL131 SLO2 – Identify common rocks and minerals found in California, including those of economic value, and explain what they tell us about regional geologic processes. [C-ID objective 3]

3. GEOL131 SLO3 – Establish timing of geologic events that have shaped a part of California, as depicted in a geologic map or cross-section, by applying relative and absolute dating principles. [C-ID objectives 5, 6]
4. GEOL131 SLO4 – Recognize landscapes typical of each of California's geomorphic provinces and explain how these landscapes and the potential hazards they pose have been shaped by the unique rock types or processes found in each province. [C-ID objectives 2, 4]
5. GEOL131 SLO5 – Outline California's geologic history and describe how the state's transition from an ancient rifted margin to a modern active one is reflected in its current geology and topography. [C-ID objective 5]
6. GEOL131 SLO6 – Analyze whether an observation, experimental result, or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others. [C-ID objective 6]

Distance Learning

This course is not currently approved for distance learning.

Board Approval: xx-xx-xxxx
PCA Established: xx-xx-xxxx
DL Conversion: xx-xx-xxxx
Date Reviewed: Fall xxxx
Catalog Year: xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 141
Catalog Course Title: Environmental Geology
Banner Course Title: Environmental Geology

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	0.000	0.0 - 0.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	3.0	48.0 – 54.0	3.0
Total Contact Hours	3.0	48.0 – 54.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Advisories

ENGL 101 Freshman Composition: Exposition

and

MATH 311 Algebra 1

Entrance Skills

Upon entering this course, the student should be able to:

ENGL 101 - Freshman Composition: Exposition

- Learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- Think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.
- Improve writing skills and techniques.

- Effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- Conduct research effectively, including investigation, collection, evaluation, and documentation, and presenting the findings in acceptable written form.
- Access and use information ethically and effectively.
- Identify both discipline specific and other information technology resources.

MATH 311 - Algebra 1

- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.
- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

Catalog Description

Environmental Geology introduces fundamental environmental and geologic principles and uses these concepts to explore humanity's interactions with the Earth. The course examines the origins of geologic hazards—such as earthquakes and floods—as well as strategies for mitigating their effects; the formation of Earth's resources and the limits their use place on humanity; and the environmental effects of pollution and land-use changes caused by human activities. This course is not open to students who have received credit for Environmental Studies 102.

Course Content

Lecture Content

1. Introduction
    a. Scientific method
    b. Earth's systems
    c. Geologic time and Earth's history
    d. Population
2. Earth materials
    a. Geochemical cycles (carbon, nitrogen, water)
    b. Minerals
    c. Rocks and the rock cycle
3. Plate tectonics
    a. Earth's interior
    b. Plate boundaries and plate boundary processes
    c. Geologic structures
4. Earthquakes
    a. Location, magnitude, and intensity
    b. Global distribution
    c. Mitigating seismic hazards

5. Volcanoes
    a. Lava compositions and eruptive styles
    b. Mitigating volcanic hazards
    c. Global distribution
6. Streams and flooding
    a. Stream networks and discharge
    b. Stream erosion, transport, and deposition
    c. Flooding and flood frequency diagrams
7. Shoreline processes
    a. Waves and wave refraction
    b. Beaches and longshore transport
    c. Man-made coastal structures
8. Mass wasting
    a. Factors promoting mass movement
    b. Types of mass movements
    c. Mitigating mass movements
9. Glaciers
    a. Formation, advance, and retreat
    b. Glacial erosion and deposition
    c. Ice ages
10. Wind, weather, and climate
    a. Extreme weather
    b. Climate change
    c. Sea level change
11. Water resources
    a. Surface water
    b. Groundwater: movement, quality, and subsidence
12. Soils
    a. Formation and classification
    b. Erosion
13. Mineral resources
    a. Metallic ores
    b. Formation of ore deposits
    c. Non-metallic minerals
14. Fossil-fuel energy resources
    a. Coal
    b. Petroleum
    c. Natural gas
15. Non-fossil fuel energy alternatives
    a. Solar
    b. Wind
    c. Nuclear fission and fusion
    d. Geothermal
16. Air and water pollution

a. Air pollutants: types, sources, and mitigation
b. Water pollutants: types, sources, and mitigation
c. Landfills

Course Objectives

At the end of the course, the student will be able to:

1. Explain how selected geologic issues can be understood in the context of the fundamental environmental principles of: population growth, sustainability, earth systems, hazardous earth processes, and the interplay between scientific knowledge and values.
2. Contrast the geologic processes that occur at different types of plate boundaries and hotspots and describe how these processes produce the unique rock assemblages found in each setting.
3. Describe the causes and characteristics of common geologic hazards—such as volcanism, seismicity, and flooding—and outline the constraints they place on human activities as well as strategies for coping with or mitigating them.
4. Describe the formation, distribution, and limits of common geologic resources—such as water, minerals, and fossil fuels—and infer the consequences of humanity continuing its current patterns of resource use.
5. Summarize the major changes—including climate change—that are occurring on Earth as a result of the waste and pollution generated by human activities and evaluate the pros and cons of the different strategies that have been proposed to deal with these changes.
6. Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others.

Methods of Instruction

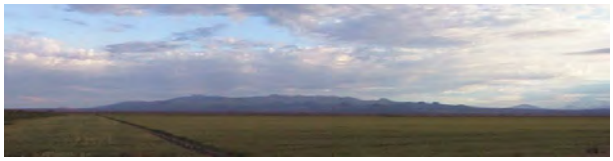
1. Lecture
2. Visiting lecturers

Assignments

1. Daily discussion questions correlated with reading assignments and lectures
2. Writing assignment: outline, preliminary abstract, and revised abstract of a recent *Scientific American* article (students choose one article from a pair provided to the class)

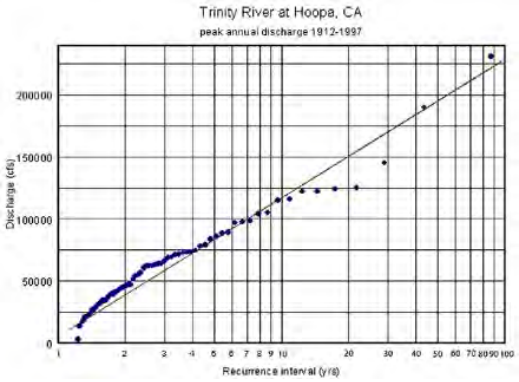
Sample discussion/exam questions:

1. In 2018 the population growth rate of humans on Earth was 1.105%. If this rate remains constant, how long will it take humans to double their current population of 7.8 billion? Round your answer to the nearest whole year.
2. The Medicine Lake Volcano (MLV) in northeastern has a low profile with gentle slopes that are underlain mostly by basalt lavas. Which type of volcano is the MLV most likely to be? Are its eruptions expected to be explosive or effusive? Why?



3. List two factors, in addition to the amount of energy released, that influence the intensity of an earthquake.

4. According to the accompanying discharge-frequency diagram for the Trinity River at Hoopa, California, what is the recurrence interval of floods with discharges of 75,000 cfs or greater? What is the probability that a flood of this size will occur during any given year?
5. While working for the EPA you are charged with evaluating the safety of water draining from an old silver mine where pyrite (FeS_2), galena (PbS), and sphalerite (ZnS) were abundant. If you measured the pH of the water what might you expect to find and why?



Methods of Evaluation

1. Quizzes (discussion questions)
2. Writing assignments
3. Exams (midterms and final)

Note: Achievement of objectives is demonstrated by means of written exams, quizzes, and writing assignments whose questions and directions require observation, recall of facts, verbal expression, some synthesis, and evidence of support for conclusions drawn. Credit is given for each correct component of a response.

Texts and Other Instructional Materials

Adopted Textbook

1. Keller: *Introduction to Environmental Geology*, 5th ed., 2012

Supplemental Textbook

1. None

Instructional Materials

1. None

Student Learning Outcomes

1. GEOL141 SLO1 - Explain how selected geologic issues can be understood in the context of the fundamental environmental principles of population growth, sustainability, earth systems, hazardous earth processes, and the interplay between scientific knowledge and values. [C-ID objectives 2, 3]
2. GEOL141 SLO2 - Contrast the geologic processes that occur at different types of plate boundaries and hotspots and describe how these processes produce the unique rock assemblages found in each setting. [C-ID objectives 2, 6]
3. GEOL141 SLO3 - Describe the causes and characteristics of common geologic hazards—such as volcanism, seismicity, and flooding—and outline the constraints they place on human activities as well as strategies for coping with or mitigating them. [C-ID objective 4]
4. GEOL141 SLO4 - Describe the formation, distribution, and limits of common geologic resources—such as water, minerals, and fossil fuels—and infer the consequences of humanity continuing its current patterns of resource use. [C-ID objectives 2, 3]
5. GEOL141 SLO5 - Summarize the major changes—including climate change—that are occurring on Earth as a result of the waste and pollution generated by human activities and evaluate the

pros and cons of the different strategies that have been proposed to deal with these changes. [C-ID objectives 2, 3]

6. GEOL141 SLO6 - Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others. [C-ID objectives 1, 5]

Distance Learning

This course is not currently approved for distance learning.

Board Approval: 05-09-2017
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Spring 2017
Catalog Year: 2018-2019

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 189
Catalog Course Title: Independent Projects in Geology
Banner Course Title: Independent Projects in Geology

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	-	-	
Lab	3.000 - 9.000	48.0 - 54.0 to 144.0 - 162.0.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	3.0 - 9.0	48.0 - 54.0 to 144.0 - 162.0	1.0 - 3.0
Total Contact Hours	3.0 - 9.0	48.0 - 54.0 to 144.0 - 162.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites
None

Entrance Skills
None

Catalog Description
Courses for students capable of independent work who demonstrate the need or desire for additional study beyond the regular curriculum. Enrollment allows students to pursue activities such as directed field experience, research, or development of skills and competencies under faculty advisement and supervision. Independent projects may be earned in most disciplines.
Students wishing to enroll in Independent Projects should contact the appropriate instructor identified in the class schedule. If the project proposed is acceptable to that instructor, a contract will be

developed. All contracts for these classes must be completed and submitted to the Records Office no later than the end of the second week of the semester.
Units are awarded depending upon satisfactory performance and the amount of time committed by the student to the course. Allowable units vary according to discipline, and are based on the following formula:
1 unit- 48 hours per semester;
2 units - 96 hours per semester;
3 units - 144 hours per semester.

Course Content

Lab Content

1. To be worked out between the student and the instructor.

Course Objectives

At the end of the course, the student will be able to:

1. Complete the contractual assignment mutually agreed to between student and instructor.
2. Submit an organized, legible and complete record of all procedures, data, and results from the project.

Methods of Instruction

1. Lab: independent study.

Assignments

Other Assignments:

1. None

Methods of Evaluation

1. The student and instructor will have met the objectives through periodic pre-designated discussions and reviews of the record book during and at the end of the project.

Texts and Other Instructional Materials

Adopted Textbook

1. None

Supplemental Textbook

1. None

Instructional Materials

1. None

Student Learning Outcomes

1. GEOL 189 SLO 1 - The student has satisfactorily completed the project as outlined in the contract.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 199A
Catalog Course Title: Topics in Geology: California Deserts
Banner Course Title: Topics in Geology: California Deserts

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 - 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites
None

Entrance Skills
None

Catalog Description
A 90-hour field trip that will explore geologic features and the geologic history of selected parts of California's deserts. The course is divided into two field trips: first, to the Mojave Desert and Death Valley National Park (prior to and partly during spring recess); and, second, to the southern California desert near Salton Sea and Anza-Borrego State Park (in the latter part of May).

Course Content

Lecture Content

1. Mojave—Death Valley organizational meeting
    a. Course requirements, goals, and objectives
    b. Death Valley trip logistics and distribution of reading materials

    c. Geological and biological features of deserts
    d. Geological and biological features of the Death Valley region
2. Anza-Borrego organizational meeting
    a. Anza Borrego trip logistics and distribution of reading materials
    b. Geological and biological features of the Anza Borrego region

Laboratory Content

1. Mojave—Death Valley field trip
    a. Red Rock Canyon and Trona
    b. Mosaic Canyon, Devil's Golf Course, Pupfish springs, and endemic plants
    c. Dante's View, Greenwater Canyon, and Titus Canyon
2. Anza-Borrego field trip
    a. Borrego Canyon, Font's Point, and the geology of the Badlands
    b. Calcite Canyon, Elephant Trees, and Pumpkin Patch
    c. Observe and trap/release of reptiles and small mammals
    d. Fossils and plants in Alvorsen Canyon
    e. Visit and discuss selected sites in the Salton Trough

Course Objectives

At the end of the course, the student will be able to:

1. Observe and collect data about geological features typical of desert environments.
2. Identify common desert geological features.
3. Maintain a notebook describing geologic features and solve problems encountered in the field.
4. Participate in the cooperative experience of camping out in a desert environment with a group of individuals.
5. Observe some major astronomical features through the use of a telescope in an optimal viewing environment away from city lights.
6. Compile a synthesis of the geologic history of selected portions of the Mojave and Anza-Borrego deserts.

Methods of Instruction

1. Lecture
2. Field trips

Assignments

Other Assignments:

1. The students will complete a workbook and notebook that document their observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and completeness of solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and evidence of critical thought.

Texts and Other Instructional Materials

Adopted Textbook

1. None

Supplemental Textbook

1. Various handouts pertaining to specific features or areas.

2. Topographic and geologic maps of areas visited.
3. Hunt, C. B.: *Death Valley: Geology, Ecology, Archaeology*, University of California Press, 1975.
4. Maxon, J. H.: *Death Valley, Origin and Scenery*, Death Valley Natural History Association, 1963.

Instructional Materials

1. Camping equipment.

Student Learning Outcomes

1. GEOL199A SLO1 – Describe the key climatic feature that defines a desert and contrast the meteorological processes that create the deserts of north-central (Mojave/Great Basin) and southern (Colorado/Sonoran) California.
2. GEOL199A SLO2 – Explain in words or with drawings how common desert landforms such as alluvial fans, arroyos, bajadas, inselbergs, and playas originate and why the landscape of the Mojave Desert is more geologically "mature" than that of the Great Basin.
3. GEOL199A SLO3 – Sketch a map of south-central California that shows the locations of the San Andreas fault, Salton Sea, and Gulf of California and use it to explain how shear along the San Andreas and related faults is creating the rift basins now occupied by the sea and the gulf.
4. GEOL199A SLO4 – List three adaptations of desert plants or animals that you studied and explain how each promotes survival in an arid environment.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 199B
Catalog Course Title: Topics in Geology: Field Geology of the California Coast
Banner Course Title: Topics in Geology: California Coast

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 - 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites
None

Entrance Skills
None

Catalog Description
A 90-hour field trip that will explore the geologic features and geologic history of selected parts of the California Coast, which may include: Point Conception, Vandenberg, Point Sal, Port San Luis, Morro Bay, Monterey Bay, as well as other areas encountered en route.

Course Content

Lecture Content

1. Organizational meeting
    a. Course requirements, goals, and objectives
    b. Geology of Coastal California
    c. Biology of Coastal California

Laboratory Content

1. California Coast field trip, which will include on-the-spot lectures and investigations where appropriate at:
    a. Morro Bay
    b. Point Sal
    c. Oso Flaco
    d. Vandenberg
    e. Figueroa Mountain
    f. Central Coast Ranges

Course Objectives

At the end of the course, the student will be able to:

1. Observe and collect data about geological features typical of coastal areas.
2. Identify common geologic features found along the California Coast.
3. Maintain a notebook describing geologic features and solve problems encountered in the field.
4. Participate in the cooperative experience of camping out in a coastal environment with a group of individuals.
5. Compile a synthesis of the geologic history of selected parts of the California Coast.

Methods of Instruction

1. Lecture
2. Field trip

Assignments

Other Assignments:

1. The students will complete a workbook and notebook that document their observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and completeness of solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and evidence of critical thought.

Texts and Other Instructional Materials

Adopted Textbook

1. None

Supplemental Textbook

1. Various handouts pertaining to specific features or areas.
2. Topographic and geologic maps of areas visited.
3. Sharp, R. S.: *Field Guide - Coastal Southern California,* Kendall Hunt, 1978.
4. Harbaugh, J. W.: *Geology Field Guide to Northern California*, William C. Brown, 1974.

Instructional Materials

1. Camping equipment.

Student Learning Outcomes

1. GEOL199B SLO1 – List the major differences between California beaches north and south of Point Conception and explain how they are related to regional differences in the orientation of the coastline and width of the continental shelf.

2. GEOL199B SLO2 – Explain in words or with drawings how common coastal landforms such as marine terraces, sea arches, spits, and stacks originate and indicate what such features tell us about either the rate of tectonic uplift or the direction of longshore transport along a coast.
3. GEOL199B SLO3 – Describe how the rocks that crop out along the California coast change as you travel from Morro Bay to Santa Barbara and explain how this change is linked to the different geologic histories of the Coast Ranges and Transverse Ranges geomorphic provinces.
4. GEOL199B SLO4 – Indicate, with reference to a simple cross-sectional sketch, which part of the oceanic lithosphere each part of the Point Sal ophiolite corresponds to.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Fall xxxx
Catalog Year: xxxx

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 199C
Catalog Course Title: Topics in Geology: Sierra Nevada
Banner Course Title: Topics in Geology: Sierra Nevada

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 - 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites
None

Entrance Skills
None

Catalog Description
A 90-hour field trip that will explore the geologic features and geologic history of selected parts of the Sierra Nevada (during the summer break).

Course Content

Lecture Content

1. Organizational meeting
    a. Course requirements, goals, and objectives
    b. Geology of the Sierra Nevada
    c. Biology of the Sierra Nevada

Laboratory Content

1. California Coast field trip, which will include on-the-spot lectures and investigations where appropriate in:
    a. Sierra Nevada foothills
    b. Yosemite National Park
    c. Sequoia-Kings Canyon National Park

Course Objectives

At the end of the course, the student will be able to:

1. Observe and collect data about geological features typical of the Sierra Nevada.
2. Identify common geologic features found in the Sierra Nevada.
3. Maintain a notebook describing geologic features and solve problems encountered in the field.
4. Participate in the cooperative experience of camping out in the Sierra Nevada with a group of individuals.
5. Compile a synthesis of the geologic history of selected parts of the Sierra Nevada.

Methods of Instruction

1. Lecture
2. Field trip

Assignments

Other Assignments:

1. The students will complete a workbook and notebook that document their observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and completeness of solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and evidence of critical thought.

Texts and Other Instructional Materials

Adopted Textbook

1. None

Supplemental Textbook

1. Various handouts pertaining to specific features or areas.
2. Topographic and geologic maps of areas visited.
3. Matthes, F. E.: *Geologic History of the Yosemite*, U.S. Geological Survey Professional Paper 160, 1930.
4. Saleeby, J., et al.: *Geologic Guide to the Kings Canyon Highway Central Sierra Nevada, California*, Cordilleran Section Geological Society of America, April 1979.

Instructional Materials

1. Camping equipment.

Student Learning Outcomes

1. GEOL199C SLO1 – Contrast the rock types you studied in the Sierra Nevada foothills with those found in and near Yosemite Valley and explain how each is related to the Mesozoic subduction zone that built Sierra Nevada volcanic arc.

2. GEOL199C SLO2 – Explain in words or with drawings how alpine glacial landforms such as arêtes, cirques, hanging valleys, moraines, and U-shaped valleys originate and indicate whether such features are actively forming in the Sierra Nevada today or, if not, why not.
3. GEOL199C SLO3 – Describe how the lode (vein) and placer gold deposits of the northwestern Sierra Nevada were formed and list two environmental consequences of mining these deposits that we are still dealing with today.
4. GEOL199C SLO4 – Contrast the amounts of precipitation that fall on the western and eastern slopes of the Sierra Nevada and explain why this difference occurs in terms of regional atmospheric behavior.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: 12-14-2004
PCA Established: x-x-xxxx
DL Conversion: x-x-xxxx
Date Reviewed: Spring 2018
Catalog Year: 2019-2020

Allan Hancock College
Course Outline

Discipline Placement: Earth Science (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: GEOL 199D
Catalog Course Title: Topics in Geology: California Transect
Banner Course Title: Topics in Geology: California Transect

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	0.380	6.0 – 6.5	
Lab	5.630	90.0 - 101.0	
Outside-of-Class Hours	-	-	
Total Student Learning Hours	6.0	96.0 - 108.0	2.0
Total Contact Hours	6.0	96.0 - 108.0	

Number of Times Course may be Repeated
None

Grading Method
Letter Grade or Pass/No Pass

Requisites
None

Entrance Skills
None

Catalog Description
A 90-hour field trip that will explore the geologic features and history of selected parts of California. The course is divided into two field trips: first; a trip transecting Southern California (prior to, and partly during spring break); and, second, a trip transecting Northern California (during the latter part of May).

Course Content

Lecture Content

1. Organizational meeting
    a. Course requirements, goals, and objectives
    b. Geology of California

i. Rocks
ii. Landforms
iii. Faults
iv. Volcanoes
v. Geologic history

c. Biology of California
i. Desert biology
ii. Alpine biology
iii. Coastal biology

Laboratory Content

1. California transect field trips, which will include on-the-spot lectures and investigations where appropriate in:
    a. Northern California
    b. Southern California

Course Objectives

At the end of the course, the student will be able to:

1. Observe and collect data about geological features typical of the California.
2. Identify common California geological features.
3. Maintain a notebook describing geologic features and solve problems encountered in the field.
4. Participate in the cooperative experience of camping out in the Sierra Nevada with a group of individuals.
5. Observe some major astronomical features by using a telescope in an optimal viewing environment away from city lights.
6. Compile a synthesis of the geologic history of selected parts of California.

Methods of Instruction

1. Lecture
2. Field trips

Assignments

Other Assignments:

1. The students will complete a workbook and notebook that document their observations and solutions to field problems.

Methods of Evaluation

1. Student workbooks will be graded for accuracy and completeness of solutions to field problems.
2. Student notebooks will be graded for completeness, neatness, accuracy, and evidence of critical thought.

Texts and Other Instructional Materials

Adopted Textbook

1. None

Supplemental Textbook

1. Various handouts pertaining to specific features or areas.
2. Topographic and geologic maps of areas visited.
3. Sylvester, A.G., Gans, E.O.: *Roadside Geology of Southern California*, Mountain Press Publishing Company (2016).

4. Alt, D., and Hyndman, D.: *Roadside Geology of Northern and Central California*, 2e; Mountain Press Publishing Company (2016).

Instructional Materials

1. Camping equipment.

Student Learning Outcomes

1. GEOL 199D SLO 1 - Accurately describe and illustrate the various internal and external earth processes responsible for the formation of areas visited.
2. GEOL 199D SLO 2 - Identify a variety of natural features seen in the areas visited and explain their formation and existence.
3. GEOL 199D SLO 3 -Explain the geologic history of the areas visited using the geologic timescale.
4. GEOL 199D SLO 4 -Take accurate, complete, and neat notes in a field setting.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: 3-13-2014
DL Conversion: x-x-xxxx
Date Reviewed: Spring 2014
Catalog Year: xxxx - xxxx

Allan Hancock College
Course Outline

Discipline Placement: Chemistry (Masters Required) or Earth Science (Masters Required) or Physics/Astronomy (Masters Required) or Physical Sciences (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: PHSC 111
Catalog Course Title: Matter, Energy, and Molecules
Banner Course Title: Matter and Energy

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	6.0	96.0 – 108.0	4.0
Total Contact Hours	6.0	96.0 – 108.0	

Number of Times Course may be Repeated
0

Grading Method
Letter Grade or Pass/No Pass

Requisites

Prerequisite
MATH 311 Algebra 1

Advisories
ENGL 514 Writing Skills 4
or eligibility for ENGL 101

Entrance Skills
Upon entering this course, the student should be able to:

MATH 311 - Algebra 1
- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.

- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

ENGL 514 - Writing Skills 4

- Write essays, including argumentation, that integrate and synthesize course readings and are clearly focused, fully developed, and logically organized.
- Produce in-class or timed essays that illustrate organizing, composing, revising, editing, and time management skills.
- Analyze and paraphrase multiple texts: drawing conclusions, making generalizations, and analyzing arguments.
- Write essays to specific audiences using an appropriate voice for those readers.
- Formulate an essay with a clear thesis statement or central idea.
- Organize essays in which the topic sentences and paragraph details support the thesis.
- Construct sentences that demonstrate control of sentence variety and effective word choice, using mostly college-level diction.
- Use strategies to accommodate and learn unfamiliar vocabulary.
- Proofread and edit essays so that they exhibit few gross errors in English grammar, use, or punctuation.
- Identify and evaluate supporting evidence.
- Follow prescribed documentation methods and properly use outside sources.

Catalog Description

Introduction to the basic principles of physical science and applications of these principles in everyday life. Topics include, but are not limited to, the following: scientific method, measurements, force and motion, work and energy, heat, waves, fluids, electricity, atomic physics, matter, compounds, molecules, chemical reactions, and ions.

Course Content

Lecture Content

1. Use of the Scientific Method
2. Newton's Laws of Motion
3. Momentum and Energy
4. Work and Energy
5. Thermodynamics: Temperature and Heat Transfer
6. Fluid Mechanics, Buoyancy, Archimedes' and Bernoulli's Principles
7. Waves and wave Effects
8. Electricity and magnetism
9. Atomic and Nuclear Physics
10. Periodic Table of Elements and periodic trends to atomic structure
11. Elements, Compounds, Molecules, and Ions. Atomic bonding
12. Mixtures

13. Chemical Reactions, Stoichiometry, and Balancing Equations
14. Acids, Bases, and Oxidation/Reduction Reactions
15. Organic Chemistry

Laboratory Content

1. Measurements and use of lab equipment, lab safety
2. Newton's Laws of Motion
3. Momentum, Impulse, and Energy
4. Work and Energy
5. Thermodynamics: Temperature and Heat Transfer
6. Fluid Mechanic, Buoyancy, Archimedes' and Bernoulli's Principles
7. Waves and Wave Effect
8. Electricity and Magnetism
9. Atomic and Nuclear Physics
10. Elements, Atomic binding, Compounds, Molecules and Ions
11. Mixtures
12. Chemical Reactions and stoichiometry
13. Acids, Bases, and Oxidation/Reduction Reactions

Course Objectives

At the end of the course, the student will be able to:

Lecture Objectives

1. Describe the methods and standards of science and the fundamental principles that govern the Universe.
2. State the major scientific principles in both verbal and in simplified mathematical form.
3. Give examples of processes which illustrate the application of a major scientific principle.

Laboratory Objectives:

1. Carry out laboratory experiments; set up equipment, take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.
2. Understand fundamentals of taking and recording measurements including measuring length, area, volume, mass, density, temperature, electric current, motion, significant figures, converting between units and scientific notion.

Methods of Instruction

1. Lecture using Microsoft PowerPoint to deliver course content including text, images and video.
2. Demonstration of scientific principles using props and equipment.
3. In lab students work on their experiments or activities, alone or in teams, with supervision and guidance by the instructor.

Assignments

1. Homework assignments consist of, but are not limited to, answering assigned questions from each chapter of the textbook and/or from the instructor.

Methods of Evaluation

1. Student performance will be evaluated by the use of lecture exams, quizzes, homework, and laboratory work.
2. The exams, homework, and quizzes will consist of problem solving exercises and short essays.

Sample essay question: Describe what is meant by the term radioactive decay. Discuss how this applies to Carbon-14 and its use in archaeological sites.

Texts and Other Instructional Materials

Adopted Textbook

1. Hewitt, Suchocki and Hewitt: *Conceptual Physical Science* 6th ed., 2020

Supplemental Textbook

1. Laboratory literature written by the instructor.

Instructional Materials

1. None.

Student Learning Outcomes

1. PHSC111 SLO1 - Carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of experiments.
2. PHSC111 SLO2 - Demonstrate knowledge of the scientific method and utilize it to develop hypotheses to answer why observed phenomena occur.
3. PHSC111 SLO3 - Understand and apply Newton's Laws of Motion, the concept of energy, and fluid mechanics to scientific problem solving.
4. PHSC111 SLO4 - Understand basic concepts in chemistry including subatomic particles, periodic properties, electron structure, kinetic molecular theory, heat and energy and ideal gas behavior.
5. PHSC111 SLO5 - Apply concepts of electricity and magnetism to make calculations using Ohm's Law, understand AC and DC currents and to explain how motors and generators work.
6. PHSC111 SLO6 - Apply concepts in nuclear physics and chemistry to understand radioactivity and decay.

Distance Learning

This course is not currently approved for distance learning.

Board Approval: x-x-xxxx
PCA Established: 3-13-2014
DL Conversion: x-x-xxxx
Date Reviewed: Spring 2014
Catalog Year: xxxx - xxxx

Allan Hancock College
Course Outline

Discipline Placement: Chemistry (Masters Required) or Earth Science (Masters Required) or Physics/Astronomy (Masters Required) or Physical Sciences (Masters Required)
Department: Life and Physical Sciences
Prefix and Number: PHSC 112
Catalog Course Title: Earth and the Universe
Banner Course Title: Earth and the Universe

Units and Hours

	Hours per Week	Total Hours per Term (Based on 16-18 Weeks)	Total Units
Lecture	3.000	48.0 - 54.0	
Lab	3.000	48.0 - 54.0	
Outside-of-Class Hours		-	
Total Student Learning Hours	6.0	96.0 – 108.0	4.0
Total Contact Hours	6.0	96.0 – 108.0	

Number of Times Course may be Repeated
0
Grading Method
Letter Grade or Pass/No Pass

Requisites
Advisories
MATH 311 Algebra 1

and

ENGL 101 Freshman Composition: Exposition

Entrance Skills
Upon entering this course, the student should be able to:

MATH 311 - Algebra 1
- State, use and identify the basic real number axioms.
- Evaluate and simplify variable expressions.
- Solve linear equations in one variable.
- Solve and graph solutions to linear inequalities in one variable.

- Graph linear equations in two variables using slope and intercept methods.
- Add, subtract, multiply and divide polynomials.
- Factor polynomials.
- Use factoring to simplify, multiply, and divide rational expressions.
- Use factoring to solve quadratic equations.
- Solve word problems at the elementary algebra level.
- Evaluate and simplify expressions involving square roots

ENGL 101 - Freshman Composition: Exposition

- Learn to read critically and to perceive the significance and meaning between structure and content in texts of varying lengths
- Think critically about their own ideas, beliefs, and assumptions as they examine and compare those of different writers.
- Improve writing skills and techniques.
- Effectively interact and communicate with varied audiences from a rhetorical and thematic perspective.
- Conduct research effectively, including investigation, collection, evaluation, and documentation, and presenting the findings in acceptable written form.
- Access and use information ethically and effectively.
- Identify both discipline specific and other information technology resources.

Catalog Description

Introduction to the basic principles of astronomy and earth sciences and applications of these principles to everyday life. Topics include the solar system, stars, galaxies, and cosmology, structure and formation of the Earth, earthquakes, volcanoes, plate tectonics, the atmosphere, the ocean, and weather.

Course Content

Lecture Content

1. Application of the Scientific Method in problem solving
2. Formation of the Universe, stars, and our solar system
3. Observation of the Sun, Moon, and stars
4. Dynamics of Earth's atmosphere, including: winds, clouds, weather, and climate
5. Air masses, jet streams, weather, and storms
6. Plate tectonics, plate boundaries, volcanoes, earthquakes, and mountain building
7. Formation of rocks in plate tectonics terms, rock cycle
8. Mineral and rock chemistry and identification
9. Structural geology: folding, faulting, and earthquakes
10. Geologic time, methods of geologic dating, fossils, and geologic history
11. Surface processes, including: streams and flooding, glaciers and climate, groundwater, and coastal dynamics as part of the hydrologic cycle.

Laboratory Content

1. Determining latitude and longitude
2. Determining the age and distance of a star cluster
3. Identifying and determining the relative ages of lunar surface features
4. Analyzing the climates of two regional cities

5. Pace and compass mapping of a campus site
6. Weather measurements and the preparation of a station model
7. Determination of seafloor spreading rates
8. Mineral identification
9. Rock identification
10. Determining earthquake location and magnitude
11. Establishing relative and absolute geologic ages
12. Calculating river discharge and flood frequency

Course Objectives

At the end of the course, the student will be able to:

Lecture Objectives

1. Describe the historical development of the theories of plate tectonics and continental drift, including the individuals involved and the major scientific discoveries that led to the adoption of these theories by the scientific community.
2. Articulate the major cosmological theories involving the evolution of the universe and outline the evidence supporting each.
3. Describe the driving forces of the tectonic and hydrologic cycles and how those cycles relate to the rock cycle.
4. Describe the processes within the hydrologic cycle, such as streams, glaciers, groundwater, etc.
5. Describe and use the scientific method.

Laboratory Objectives:

1. Carry out laboratory experiments: take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.
2. Identify various rocks and minerals and describe their formation in terms of plate tectonics and the hydrologic cycle.
3. Gather information from topographic maps, geologic maps, cross sections, stratigraphic columns, and aerial photographs to solve geological problems, such as natural hazard mitigation.
4. Describe the location of various night and day time sky objects. This includes, but is not limited to, the Moon, Sun, Polaris, and various constellations, depending on the season.
5. Describe and use the scientific method.

Methods of Instruction

1. Lecture using Microsoft PowerPoint to deliver course content including text, images and video.
2. Demonstration of scientific principles using props and equipment.
3. In lab students work on assignments or activities, alone or in teams, with supervision and guidance by the instructor.

Assignments

Outside assignments consist of answering assigned homework questions from each chapter of the textbook and/or from the instructor. Also, students are asked to make observations of the Sun, Moon, and stars depending on the season.

Methods of Evaluation

1. Student performance will be evaluated by the use of lecture exams, quizzes, homework, and laboratory work.
2. The exams, homework, and quizzes will consist of problem solving exercises and short essays.

Texts and Other Instructional Materials

Adopted Textbook

1. Hewitt, Suchocki and Hewitt: *Conceptual Physical Science* 6th ed., 2020.

Supplemental Textbook

1. Laboratory literature written by the instructor.

Instructional Materials

1. None.

Student Learning Outcomes

1. PHSC112 SLO1 - Demonstrate the ability to accurately describe and illustrate the various internal (e.g. plate tectonics, earthquakes, volcanoes, etc.) and external (e.g. streams, groundwater, glaciers, etc.) Earth processes.
2. PHSC112 SLO2 - Demonstrate the ability to identify a variety of rocks and minerals and explain their formation in terms of plate tectonic theory.
3. PHSC112 SLO3 - Identify local geologic features and describe the geologic processes responsible for their formation.
4. PHSC112 SLO4 - Illustrate the interrelationships between the marine and atmospheric environments.
5. PHSC112 SLO5 - Illustrate the formation of the Solar System.

Distance Learning

This course is not currently approved for distance learning.

May 13, 2011 (Updated 12/4/12; 7/24/20)
5-Year Review: June 30, 2016

Geology Transfer Model Curriculum

CCC Major or Area of Emphasis: **Geology**
CSU Major or Majors: **Geology, Geophysics, Earth Science are possibilities**
Total units **26 minimum** *(all units are semester units)*

Degree Type: AS-T

"Core" Courses:
26 minimum units

Title (units)	C-ID Designation	Rationale	AHC Courses
Physical Geology with Lab (4) OR Physical Geology (3) AND Physical Geology Laboratory (1)	GEOL 101 OR GEOL 100 AND GEOL 100L	Universally required; fulfills CSU Areas B1 and B3	GEOL 100 (4 units) (**C-ID Approved**)
Historical Geology with Lab (4) OR Historical Geology (3) AND Historical Geology Laboratory (1)	GEOL 111 OR GEOL 110 AND GEOL 110L	Universally required; fulfills CSU Areas B1 and B3	GEOL 111 (4 units) **(C-ID approved)**
General Chemistry for Science Majors Sequence A (10)	CHEM 120S	Universally required; fulfills CSU Areas B1 and B3	CHEM 150 (5 units) & CHEM 151 (5 units) (**C-ID Approved**)
Single Variable Calculus I – Early Transcendentals (4) and Single Variable Calculus II – Early Transcendentals (4) or Single Variable Calculus I – Late Transcendentals (4) and Single Variable Calculus II – Late Transcendentals (4) or Single Variable Calculus Sequence (8)	MATH 210 and 220 OR MATH 211 and 221 OR MATH 900S	Universally required; fulfills CSU Area B4	 MATH 181 (4 units) & MATH 182 (4 units) (**C-ID Approved**)

Additional recommended preparation (not part of the TMC):			
RECOMMENDED WHERE AVAILABLE Calculus-Based Physics for Scientists and Engineers: A (4) and Calculus-Based Physics for Scientists and Engineers: B (4)	PHYS 205 and 210	.	PHYS 161 (4 units) & PHYS 163 (4 units) (**C-ID Approved**)
RECOMMENDED FOR LIFE SCIENCE GENERAL EDUCATION REQUIREMENT Organismal Biology (4)	BIOL 140	Fulfills CSU Area B2	
RECOMMENDED WHERE AVAILABLE Mineralogy (4)	GEOL 280		

Any course listed in this transfer model may be double-counted with appropriate general education requirements.
Due to the limits imposed by SB 1440, the Geology FDRG had to determine how to "fit" major preparation into the 60 unit limit. Ideally students need to complete an entire year of geology (C-ID Geology 101 & 111) along with an entire year of general chemistry, calculus, calculus-based physics, and possibly mineralogy (C-ID Geology 280), if it is taught at the institution, to be prepared for junior year coursework. As such, the proposed TMC is followed by coursework that would not be a component of the TMC, but that students could be recommended to complete prior to transfer

Summary

The Geology TMC was initially developed at the October DIG meetings. Shortly after the DIGs, the FDRG was convened and the TMC that was posted for vetting reflected the FDRG's effort to reconcile the slight differences in the initial DIG products. Online vetting was conducted, with the former IMPAC list-serv being used to reach discipline faculty, and CIAC, CCC Senate Presidents, and CCC Curriculum Chairs. The TMC that was vetted, however, violated the unit limits. As a consequence, the FDRG reconvened to determine how best to decrease the units. The original TMC included physics. When units had to be dropped, it was clear that removing physics made sense as the 1st vetting yielded numerous negative comments regarding the physics requirement. The 2nd vetting yielded more positive reaction, but continued voices arguing for the inclusion of a number of courses that are not universally required. Additional details can be found below.

There were comments about the Historical Geology requirement. A few colleges said that they did not offer Historical Geology, however, these colleges also for the most part have low enrollment in Geology, and Historical Geology is so widely a necessary component of the degree across the state, it was decided that it must be kept in the TMC.
Comments about additional courses such as Field Methods and Oceanography were also addressed. We have no room for extra courses in the TMC, particularly courses that are not universally required, let alone offered in very few places at the CC level. So long as Physics must remain on the recommended (rather than required) list, these other courses shall remain off the TMC and will be considered at the individual CSU/UC's discretion. Finally, there were comments about the inclusion of Mineralogy and Biology courses. These courses are only recommended for additional preparation and are not a part of the TMC.

5-Year Review

Many of the requests for changes were similar in nature to the issues addressed when the TMC was developed. Adding Environmental Geology, Field Geology, Oceanography, an additional semester of Calculus, and requiring Physics have already been addressed in the development of the TMC and it was determined that the current TMC adequately meets the needs of Geology students transferring from a CCC to a CSU.

Since most of the respondents did not see a necessity in changing the TMC CORE for the AS-T in Geology and given that the majority of negative comments dealt with local issues, it is recommended that there be no changes made to the current TMC.

Allan Hancock College
Associate in Science in Geology for Transfer

Criteria A. Appropriateness to Mission

1. **Statement of Program Goals and Objectives**

The goal of the Geology program is to guide students in developing an understanding the of geologic processes that are shaping Earth today as well as the changes the planet and the life it supports have undergone during the past 4.6 billion years through study in the classroom, laboratory, and field.

2. **Catalog Description**

Geology is the study of the Earth. Geologists apply a wide range of scientific ideas and techniques to understand both the processes that are changing the planet today as well as those that have shaped it—and the life it supports—during the past 4.6 billion years. Geologists play key roles in helping society manage Earth resources, assess the threats posed by geologic hazards, and understand the rapid changes now occurring in the planet's environment. All these issues are expected to become more critical as Earth's human population grows, which is why the geoscience workforce is predicted to increase faster during the coming decade than the overall U.S. workforce. Situated in California's youthful and dynamic Transverse Ranges, Allan Hancock College is well situated to give prospective geology students diverse field experiences and excellent preparation for transfer to a 4-year college or university. The Associate of Arts in Geology for Transfer will prepare students for further studies toward a California State University (CSU) baccalaureate degree in Geology and other Earth Sciences.

The graduate of the Associate of Science in Geology for Transfer will be able to:
• Identify a variety of common rocks and minerals and explain what each tells us about the geologic processes that produced it.
• Establish the timing of the geologic events that have shaped a region, as depicted on a geologic map or cross-section, by applying relative and absolute dating principles.
• Distinguish the three types of boundaries that separate Earth's lithosphere plates and explain how the stress at each is related to the deformation, seismicity and volcanism observed there.
• Explain how the contrasting properties of different regions of Earth's interior have enabled us to map the planet's internal structure and link processes there to those occurring at the surface.

• Recognize common landforms from their depictions on topographic maps and analyze how each is formed through interactions between constructional processes and erosion caused by the movements of water, wind and ice.
• Identify a variety of common fossils, describe the place of each in the history of life and explain how fossils, collectively, enable us to assess the roles that natural selection and environmental change have played in shaping life on Earth.
• Apply principle of actualism to infer past environmental conditions using rock characteristics, stable isotope ratios, seawater Ca/Mg ratios and similar measurements.
• Outline major events that have shaped Earth's history and determine the approximate period depicted by a paleogeographic map during Late Proterozoic or Phanerozoic time.
• Analyze whether an observation, experimental result or proposed explanation is consistent with a scientific hypothesis for a natural phenomenon and effectively communicate this analysis to others.

Associate Degrees for Transfer Requirements

Completion of 60 semester units that are eligible for transfer to the California State University, including the following:

1. The completion of the Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education – Breadth Requirements (CSU GE).
2. A minimum of 18 semester units or 27 quarter units in a major or area of emphasis, as determined by the community college district.
3. Obtainment of a minimum cumulative transfer grade point average of 2.0, with all courses in the major being completed with a grade of "C" or better.

Term 1	Term 2	Term 3	Term 4
Major Courses	Major Courses	Major Courses	Major Courses
MATH 181: Calculus I	MATH 182: Calculus II	CHEM 150: General Chemistry	CHEM 151: General Chemistry
GEOL 100: Physical Geology with lab	GEOL 111: Historical Geology with lab		
GE Courses	GE Courses	GE Courses	GE Courses
ENGL 101: Freshman Composition: Exposition [A2]	ENGL 103: Critical Thinking and Composition [A3]	HIST 107/108: U.S. History to 1877 *or* U.S. History after 1877 [D]	PSY 112/113/117/118 or SOC 110 [D, E]
SPCH 101: Public Speaking [A1]	Area C1	BIOL 100 Introductory Biology [B2]	POLS 101/103: Introduction to Political Science *or* American Government [D]
		Area C2	Area C1 or C2
Student Support	Student Support	Student Support	Student Support
math tutoring	math tutoring	chemistry tutoring	chemistry tutoring
English tutoring	English tutoring	biology tutoring	

Proposed Guided Pathways schedule for the Geology AS-T degree