Barstow Community College

INSTRUCTIONAL PROGRAM REVIEW

(Refer to the Program Review Handbook when completing this form)

PROGRAM:	EARTH SCIENCE (Astronomy, Geology, Oceanography, Physical Science)			
Academic Year:	2015-2016	**FULL PROGRAM REVIEW**	**Date Submitted:**	10/19/2015
Academic Year:		**ANNUAL UPDATE #1**	**Date Submitted:**	
Academic Year:		**ANNUAL UPDATE #2**	**Date Submitted:**	

By:

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1. Program Mission and Vision

A. Program Mission

The Program of Earth Science's Mission is to examine the physical universe and its natural phenomena. The program helps the student develop an appreciation and understanding of the scientific method and allows the student to apply logical, quantitative, and qualitative reasoning in solving problems and analyzing arguments in the Earth Sciences. The Earth Science Program offers a wide variety of courses, each of which is unique in its treatment of diverse topics. Many of the courses have a laboratory component that gives instructors the unique opportunity to really know and work with their students. The laboratory environment promotes teamwork and student-student and student-instructor interactions.

B. Program Vision *(Where would you like the Program to be three years from now?)*

The Program of Earth Science's Vision is to achieve and maintain excellence in student learning and success. Our program will provide quality education in all of the Earth Science fields in order for our students to attain successful pathways to degree completion, transfer to other colleges and universities, potential career opportunities, and lifelong learning.

C. Describe how mission and vision align with and contribute to the College's Mission and Vision

A. College's Mission: "Providing our students, community, and military population with the educational tools to achieve personal goals and professional growth. To accomplish this, the college offers traditional and distance education courses, programs, and pathways designed to enhance student success, leadership development, and career opportunities, enabling all in the community to thrive in a changing global society." This Mission is accomplished in the Earth Science Program through a variety of courses that offer a diversity of topics, and emphasizes critical thinking and Laboratory skills. The following earth science courses meet the associate degree requirements for CSU transfer and for IGETC requirements: ASTR 1, ASTR 1L, GEOL 1L, GEOL 2, GEOL 3, GEOL 4, OCEA 1, PHSC 1, and PHSC 2. These courses have been designed and articulate for Natural Science/Math majors transferring to four-year colleges and universities. The goal of all these courses is to provide the necessary background and tools for students to achieve the institutional or general education goals of Barstow Community College, and for possible transfer to another institution of higher learning. The over-arching Earth Science Program goals are: communication, critical thinking, professional development, and global awareness. All of the courses in the Earth Science Program strive to prepare our students for continuing work at a transfer institution, and to achieve personal goals, career objectives, and professional growth.

B. College's Vision: "Empowering Students to Achieve Their Personal Best Through Excellence in Education." All of the departments in the Program of Earth Science offer their own course curriculum, each of which is unique in its treatment of diverse topics. In our Program many of the courses have a laboratory component, which gives the instructor a unique opportunity to really get to know and work with their students on a one-to-one basis. The laboratory environment promotes teamwork, student-student, and student-instructor interactions. With a variety of learning methodologies and teaching strategies, it is possible for students to choose a learning style that most closely matches theirs. Many of our students have difficulty with their initial college science courses; and the Earth Science Program is committed to empowering and helping students to achieve their very best.

2. Program Description and Overview

Assume the reader does not know anything about the Program. Describe the Program, including—but not limited to—the following:

A. Organization, including staffing and structure

The Earth Science Program is included within the Math, Science, and Physical Education Division at the college. There are four separate departments within the program - Geology, Astronomy, Oceanography, and Physical Science. There is one full-time Earth Science/Astronomy instructor, and currently two part-time (adjunct) Astronomy instructors.

B. Who do you service (including demographics)?

Barstow College, established in 1959, is in the Mojave region of San Bernardino County, approximately 120 miles from both Los Angeles and Las Vegas. The college serves the communities of Barstow, Lenwood, Newberry Springs, Daggett, Yermo, Hinkley, Ludlow and Baker. The college also provides on-site programs to military personnel at the U.S. Army National Training Center, Ft. Irwin, and to off-campus students through a large online program. Recognizing that students have varying learning styles, have preferences for particular learning formats, or have extremely tight schedules, students at BCC have the flexibility to enroll in online classes, traditional "live" classes, or hybrid classes.

Our Earth Science Program provides courses for students that are in the process of attaining their Associate Degree at BCC, and transfer courses to those students that are interested in completing a Bachelor's degree at a four-year college or university. The program also provides classes for those who are interested in continuing their education, but may not be pursuing a degree.

City of Barstow Demographics (from http://www.barstowca.org)

Population: 23,219
Males: 51.4 %
Females: 48.6 %
Median resident Age: 33.1 years
Median Household Income: $40,970
Hispanic: 45.4%
White: 32.5%
Black: 10.9%
Pacific Islander: 4%
Asian: 3.4%
Two or more races: 3.2%
Native American: 0.4%

Barstow Community College Demographics: (BCC Student Success Scorecard)

GENDER		RACE/ETHNICITY	
Female	58.1%	African American	14.0%
Male	41.1%	American Indian/Alaska Native	0.8%
Unknown Gender	0.8%	Asian	2.0%
AGE		Filipino	1.7%

Under 20 years old	22.6%	Hispanic	37.5%
20 to 24 years old	27.2%	Pacific Islander	0.8%
25 to 39 years old	35.0%	White	35.0%
40 or more years old	15.2%	Two or More Races	4.5%
Unknown Age	0.0%	Unknown Ethnicity	3.6%

Other Information (2013-14)

Full-Time Equivalent Students	2,596.9
Credit Sections	1,016
Non-Credit Sections	22
Median Credit Section Size	19
Percentage of Full-Time Faculty	44.4%
Percentage of First-Generation Students	0.0%
Student Counseling Ratio	

C. What kind of services does your unit provide?

Our Program provides the basic requirements for all earth science programs, with special emphasis in the Geology discipline. The following Earth Science courses are offered in the program: ASTR 1, ASTR 1L, GEOL 1L, GEOL 2, GEOL 3, GEOL 4, GEOL 5, OCEA 1, PHSC 1, and PHSC 2. These courses have been designed and articulate for Natural Science/Math majors transferring to four-year colleges and universities. All of these courses are part of the Program's Two-Year Schedule and are provided regularly to students. Weekly Office Hours are also offered in order to assist and tutor students.

D. How do you provide them?

The Earth Sciences Department provides both day and evening classes in all of the disciplines. All of our courses are provided in traditional (live) format, but ASTR 1, Introduction to Astronomy, is provided in both traditional and online (Distance Ed) delivery methods. We also offer earth science courses in the traditional (live) format at the Fort Irwin satellite campus.

On the BCC Main Campus, most of the Earth Science courses are taught in the Earth Science Laboratory Classroom, also know as the Co-Lab. This facility was carefully designed and constructed several years ago to be used in the live delivery of all courses across the Earth Science spectrum including those within the disciplines of Geology, Astronomy, Oceanography, and Physical Science. The Co-Lab has 16 Student Work Stations that can accommodate up to 2 students each. There is Electricity, Water, Gas, and compressed Air at each Station. Each Station also has a State-of-the-Art Computer that can be shared by two students. Teaching in the Co-Lab allows for more activity-based, hands-on, experiential learning to take place, as well as being able to utilize state-of-the-art computer software.

For the Observational Astronomy courses, classes are taught in our Astronomical Observatory which houses a 16" Schmidt-Cassegrain Reflector Telescope on an Equatorial Mount. The Telescope is the largest instrument of its kind in the area.

Office hours are scheduled weekly during both daytime and evening hours, and we accommodate students who work full time and are unable to meet during those office hours by scheduling other appointments on an as-needed basis. For distance education courses, special online office hours are offered.

E. Does the program have a degree or certificate?

The courses in the Program are part of the Associate of Science Degree in Natural Science/Math.

3. Program Data

A. PERFORMANCE DATA

Discuss the program's performance on the specific data items listed below:

1) Full-Time/Part-Time Faculty Ratio

ASTR = 1 to 1.49 (One Full-Time, Two regular Part-Time)
GEOL = 1 to 0
OCEA = 1 to 0
PHSC = 4 to 1 (One Full-Time, One occasional Part-Time)

	TRADITIONAL	ONLINE
2) Course Completion Rate (Retention)		
ASTR 1	0.65	0.91 TOTAL: 0.85
ASTR 1L	0.97	
GEOL 1L	0.74	
GEOL 4	0.86	
OCEA 1	0.85	
PHSC 2	0.83	
3) Course Success Rate		
ASTR 1	0.72	0.77
ASTR 1L	0.90	
GEOL 1L	0.74	
GEOL 4	0.86	
OCEA 1	0.78	
PHSC 2	0.65	
4) WSCH/FTEF Ratio (Efficiency)		
ASTR 1	715	
ASTR 1L	317.65	
GEOL 1L	154.05	
GEOL 4 Full-time:	285	
OCEA	405	
PHSC	450	

ASTR 1 PHSC 2	Part-time:	271.0	931.7

5) Fill Rate		
ASTR 1	1.08	1.11
ASTR 1L	0.90	
GEOL 1L	0.63	
GEOL 4	0.59	
OCEA	0.84	
PHSC	0.94	

Reflect on the data above:

1) **Full-time/Part-time Faculty Ratio**: We have a sufficient number of instructors to meet the demand in the program. There is a Full-Time to Part-Time faculty ratio that does not indicate the need for the creation of any other Full-Time positions in the program. Currently we are offering two to three online sections of the ASTR 1 course per semester. Part-Time instructors usually teach these, and we are having success with securing a sufficient pool of adjuncts to meet our demand in this area.

2) **Course Completion Rate (Retention):** Generally the Course Completion Rate for all of the courses in the Earth Science Program is very high. The one notable exception is the Course Completion Rate for the traditional delivery of ASTR 1, Introduction to Astronomy. A comparison with previous years' retention rates indicates this to be a bit of an anomaly. However, these Completion Rates are still lower than for other courses in the program. This may be due to the difficultly of the subject matter combined with a lack of sufficient preparation for such a rigorous science course on the part of some of the students. It is worth noting that the overall Course Completion Rate for ASTR 1 is 0.85, which is rather high.

3) **Course Success Rate:** Generally the Course Success Rate for all courses in the Earth Science Program is very positive. The one notable exception is the Course Success Rate for PHSC 2, Introduction to Earth Science. Since this course is usually comprised of the most underprepared and science-phobic students at the college, this may contribute somewhat to the lower than normal Success Rate. However, it is definitely worth noting that the vast majority of students that ACTUALLY complete the course and take the Final Exam do earn a "C" or better. Almost all of the failing grades in this course are from students that stopped attending AFTER the drop deadline, but well BEFORE the end of the class.

4) **WSCH/FTEF Ratio (Efficiency):** WSCH/FTEF Ratio, or efficiency, was strongest for the Astronomy 1 course, and weakest for the Geology courses. Enrollment in the Geology courses was a little lower than in previous years, and this undoubtedly affected these numbers. As a way of improving efficiency, GEOL 4 may only be slated for a once a year delivery, instead of being offered every semester. Perhaps some additional advertising and marketing is necessary for this course as well. ASTR 1L is our Observational Astronomy course, and the maximum enrollment per class (20) is limited by the available space in the Astronomical Observatory. Enrollments for this course have been very strong taking into consideration the classroom capacity.

5) **Fill Rate:** The Fill Rate is superb for all courses in the program except the Geology courses, GEOL 1L and GEOL 4. Enrollment in the Geology courses was a little lower than in previous years, and this undoubtedly affected these numbers. In the future GEOL 4 may only be offered for delivery once a year. The counselors will be contacted to make sure that they are sufficiently recommending the courses in

the Geology Department to those students that could benefit from taking them. Perhaps some additional advertising and marketing is necessary for both of these courses as well.

B. PROGRESS ON PROGRAM LEVEL OUTCOMES (PLOS) AND STUDENT LEARNING OUTCOMES (SLOS)

1) List your Program Level Outcomes (PLOs).

Numbers Indicate the Relationship of Program Learning Outcomes (PLOs) to the Outcomes Assessment: Core Competencies

1. Communication
2. Critical Thinking
3. Global Consciousness (Awareness)
4. Personal Development and Responsibility

PLO #1. Students will be able to demonstrate, orally and in written form, an understanding of the processes of earth science, the scientific method, and the relationship between scientific research and established knowledge. This includes the ability to

a. Recognize the way in which research leads to generally accepted conclusions and the integration of new research data with the building of a body of scientific knowledge, and/or (1,3,4)
b. Design a scientific inquiry, including use of proper controls and analyses, and/or (2)
c. Demonstrate critical thinking skills shown by the analysis of data sets and the synthesis of information to draw conclusions, and/or (2,3)
d. Produce an essay explaining scientific processes in clear and concise terms, and/or (1)
e. Produce laboratory reports which address background information, procedures, results, and analysis of data during a lab exercise or inquiry project. (1,2)

PLO #2. Students will be able to demonstrate both content knowledge in earth science and test taking skills when completing essay and objective exams. This includes the ability to

a. Demonstrate problem solving abilities in the major content areas of science, and/or (1,2)
b. Analyze the logic of objective questions and choosing the correct answers, and/or (1,2)
c. Writing clear concise responses to essay questions. (1,2,4)

PLO #3. Evaluate scientific data, draw reasonable conclusions, recognize the ethical implications of these conclusions, and apply these conclusions to personal, community, or scientific problems. This includes the ability to

a. Choose what data to collect in order to address a specific hypothesis, and/or (2,3)
b. Collect data and keep organized records, and/or (2)

c. Ability to reach and clearly express logical conclusions based on scientific data, and/or (1,2,3)
d. Relate how scientific information is relevant to personal and community issues, and/or (4)
e. Recognize the ethical implications of scientific research and the responsibility to use knowledge wisely. (4)

2) Summarize the progress you have made on Program Level Outcomes.

The Earth Science Program drafted and finalized its Program Learning Outcomes (PLOs) for its 2012 Program Review (see above). In addition, the Program has begun the assessment process for its Program Level Outcomes (PLOs). Program Level Outcomes are being measured in three different ways. Success and retention data for each department and course is being used as well as a student survey for a direct measurement. That data is currently being aggregated and program norms are being established.

3) Summarize the progress made on course-level outcomes and assessments; use specific data, if possible.

All courses in the Earth Sciences Program have had Student Learning Outcomes (SLOs) drafted, measured and assessed for at least the last TWO regular Program Review Cycles (six years). All course level SLOs continue to be measured and assessed each semester for each class.

The Assessments for the 2014-2015 academic year based upon measurement of Course-Level Student Learning Outcomes are as follows:

	Fall 2014	Spring 2015
ASTR 1:		
SLO #1: Student Success Rate =	75%	70%
SLO #2: Student Success Rate =	75%	70%
SLO #3: Student Success Rate =	83%	85%
ASTR 1L:		
SLO #1: Student Success Rate =	79%	75%
SLO #2: Student Success Rate =	85%	85%
SLO #3: Student Success Rate =	88%	80%
GEOL 4:		
SLO #1: Student Success Rate =	70%	72%
SLO #2: Student Success Rate =	70%	72%
SLO #3: Student Success Rate =	83%	85%
OCEA 1:		
SLO #1: Student Success Rate =		70%
SLO #2: Student Success Rate =		70%
SLO #3: Student Success Rate =		80%
PHSC 2:		
SLO #1: Student Success Rate =	67%	63%
SLO #2: Student Success Rate =	67%	63%
SLO #3: Student Success Rate =	88%	84%

GEOL 1L:
SLO #1: Student Success Rate = 68%
SLO #2: Student Success Rate = 68%
SLO #3: Student Success Rate = 85%

4) Describe any program, course, and/or instructional changes made by your program as a result of the outcomes assessment process.

Based upon the process of outcomes assessment, the following changes were made during this last Program Review Cycle:

ASTR 1:
1) The Sky Journal Research Projects were collected at the midterm point in the semester for an initial evaluation. In addition, students were provided with some in-class time to work on their Sky Journal Project. The Project was also distributed to the students on the very first day of instruction allowing them more completion time.

2) A NEW Comprehensive Study Guide was added and appears to be helping with student learning.

3) Several lecture units in ASTR 1 have been expanded to include activities utilizing the telescope in our Astronomical Observatory.

ASTR 1L:
1) Labs where the student average score was less than 70% were reviewed: some of the labs were altered, and one was deleted with a new lab substituted.

2) All of the computers as well as the Astronomy software were completely upgraded with new state-of the-art versions, and this appears to be fostering a more diverse and comprehensive learning environment.

GEOL 4:
1) The geology software in the classroom was upgraded, and students were given more of an opportunity during class time to utilize the new computer programs. This appears to have contributed to greater student learning.

2) More hands-on experiential learning activities were added to the course including Sedimentary Rock and Fossil Identification.

OCEA 1:
1) A Library Tutorial was scheduled during the semester to allow students to better understand the research process, and to be better exposed to all of the tools and assistance that are available to them. Students indicated that they thought this was helpful.

2) Students were required to submit an Outline for their Research Project Assignment at the Midterm point of the semester. Students were provided with some in-class time to work on their research and the handout for the Project was given to the students earlier in the semester.

3) A New Comprehensive Study Guide for each Exam was developed and distributed to students.

GEOL 1L:
1) A New Comprehensive Study Guide for each Exam was developed and distributed to students.

2) The Outline for the Research Project will now be due at the halfway point in the semester to increase preparedness.

3) Fossil Identification with actual specimens has been added to the Geologic Time unit.

PHSC 2:
1) Individual Questions on Exams where less than 50% of students scored correct were analyzed and changes were made to improve those areas of instruction. As a result, several problematic questions were changed or deleted from the Exams and new updated questions were added.

2) The Research Project was distributed to the students on the very first day of instruction allowing them more completion time.

5) Reflecting on the responses for #2 and #3 above, what will you implement for the next assessment cycle?

a) A student tutor for ALL courses will be recommended to Tutorial Services in order to assist students.

b) ALL exams in ALL courses will be reviewed to make sure that problematic questions are analyzed and changes are made to improve those questions and/or areas of instruction before the next time that the course is taught.

c) More one-on-one communication opportunities between the instructor and individual students in preparation for the exams will be added to the course.

d) Outlines for Research Projects in ALL courses taught will be assigned to the students and submitted to the instructor by the halfway point in the semester so that direct feedback can be given.

e) Students may benefit from additional communication with the instructor for other activities as well. Accordingly, one-on-one class time will be provided between the instructor and the Research Project groups for consultation, assistance, and to help guide the students and/or answer any questions. Groups will also be required to present a weekly oral update on their progress with this project to the instructor. A Grading Rubric, created from the assignment Checklist, will be implemented for the Research Project.

f) Outlines for ALL Oral Presentations in ALL classes will now be required to be submitted from ALL students. Students will be required to submit a more comprehensive outline on their presentation in advance and provide references (and citations) as well. One-on-one time between the instructor and each student will be provided to guide/help the student on the Oral Presentation Project and/or answer any questions. A Grading Rubric will be created and implemented for the Oral Presentation Assignment.

g) Library Exercises and Tutorials will now be a part of ALL of the courses taught in every department.

h) New Computer Activities for ALL courses will be added and enhanced due to the upgrade of all of the computers and software programs in the Earth Science Laboratory Classroom.

C. SUPPORTING ASSESSMENT DATA *(See Handbook for additional information)*

1) Provide a list of any additional measures *(not included in 3.A.)* that you have chosen to gauge your program's effectiveness *(e.g.: transfers, degrees, certificates, satisfaction, student contacts, student headcount, Perkin's data, etc.).*

Degree/Transfer Completion Outcomes (from Student Success Scorecard Data):

COMPLETION: (Percentage of degree, certificate and/or transfer-seeking students starting first time in 2008-09 tracked for six years through 2013-14 who completed a degree, certificate or transfer-related outcomes.)

COLLEGE PREPARED: 59.3% (Student's lowest course attempted in Math and/or English was college level)

UNPREPARED FOR COLLEGE: 40.5% (Student's lowest course attempted in Math and/or English was remedial level)

OVERALL: 43% (Student attempted any level of Math or English in the first three years)

HEADCOUNT by Academic Year: (from 2013-14 FactBook, *Original Source: CCCCO MIS Referential Data)

2009-10: 7046
2010-11: 4235
2011-12: 4745
2012-13: 4730
2013-14: 4710

DEGREES TOTAL: (from 2013-14 FactBook, *Original Source: CCCCO MIS Referential Data)

2009-10		2010-11		2011-12		2012-13		2013-14		Last Year Chg	5-Yr Avg	5-Yr Chg
AA Degree	154	44.3 %	160	44.0 %	174	48.6 %	141	55.5 %	169	52.5 %	-5.5%	49.0 %	18.6%
AS Degree	176	50.6 %	177	48.6 %	171	47.8 %	103	40.6 %	139	43.2 %	6.5%	46.1 %	-14.6%

AS DEGREES - Biological and Physical Sciences: (from FactBook, Original Source: CCCCO MIS Referential Data)

2009-10: 32 (18.2%)
2010-11: 35 (19.8%)
2011-12: 32 (18.7%)
2012-13: 22 (21.4%)
2013-14: 34 (24.5%)

1a) If this is a CTE program ending with a certificate or degree, include data on employment opportunities, compliance with advisory recommendations, and fiscal viability of program. *(Include labor market and demand information using resources in CTE and the PR Handbook.)*

N/A

2) Summarize the results of the measures listed in #1 above:

a) Completion:
BCC Completion Rate for College Prepared Students: While the State Completion Rate has maintained at approximately 70% throughout the last five years, THE BCC Completion Rate is at 59.3% in the most recent period.
Overall Completion Rate: Barstow College has a slightly lower Completion Rate as compared to the Statewide Completion Rate. For the most recent year, BCC had an Overall Completion Rate of 43%, and statewide it was 47%. Our Completion Rates for College Prepared Students and Overall need to improve to come in line with at least the California State Average.

b) Headcount: The number of students has dropped since 2009-10 and is now holding at about 4,700 for the past three academic years. Overall, there has been a decrease of 33.2% over the last five years, but there has been only a slight decrease of 0.4% in the last academic year.

c) AS Degrees: Although there has been a decrease in the number of AS degrees conferred, from a high of 50.6% in 2009-10 to 43.2% in 2013-14, the number of AS Degrees awarded in Natural Science has actually increased over this same time period.

3) What did you learn from your evaluation of these measures, and what improvements have you implemented, or do you *plan** to implement, as a result of your analysis of these measures? *(*List any resources required for planned implementation in #10: Resources.)*

Despite a decrease in the numbers of students as reflected by the most recent Headcount, there appears to be an increase in the numbers of AS Degrees awarded in Natural Science. This is another good indication of the general success of the Earth Science Program, and that we are on a positive track. We will continue to track the number of degrees awarded in Natural Science and Mathematics.

D. TWO YEAR SCHEDULING PLAN

1) What is the program's Two-Year Scheduling Plan?

Earth Science Two-Year Scheduling Plan:

Year #1
Fall Semester: GEOL 1L, PHSC 2, ASTR 1, ASTR 1L, GEOL 4
Spring Semester: PHSC 2, ASTR 1, ASTR 1L, GEOL 2, OCEA 1

Year #2
Fall Semester: GEOL 3, PHSC 2, ASTR 1. ASTR 1L, GEOL 4
Spring Semester: PHSC 2, ASTR 1, ASTR 1L, OCEA 1, GEOL 4

**Two to three sections of ASTR 1 Online are offered each semester in addition to the Traditional (Live) course.

***PHSC 1, Physical Science for General Education, has not been offered in many years. This is an interdisciplinary science course, where about half of the course is Earth Science, and the other half is Chemistry and Physics. It is hoped that our new Chemistry Professor may be interested in team teaching

this course in the near future. Otherwise, we are probably looking at archiving the course, until we are ready to offer it on a regular basis as part of our Two-Year Scheduling Plan.

2) What changes, if any, have been made since the last Program Review?

No changes have been made to the Two-Year Scheduling Plan during the last Program Review Cycle.

3) How effective has the Two-Year Scheduling Plan been in meeting student needs and educational goals? If this is a degree or certificate pathway, can students complete in two years?

The Earth Science Two-Year Scheduling Plan has been effective in meeting student needs and educational goals. A measure of the effectiveness is the continued strong enrollment in Natural Science courses, and the increase in the number of Natural Science Degrees awarded at the institution. No matter what their major, students are able to easily take all of their Natural Science Requirements in two years.

4) Reflecting on the responses above, what are the goals for the next program review cycle?

The Earth Sciences Program has had a Two-Year Scheduling Plan on file since the year 2000 at BCC. We will continue to review the Two-Year Scheduling Plan during each Regular Program Review Cycle in order to make any indicated changes or additions. We will also continue to gather and analyze data that better helps us understand the needs of our students, and better align our program goals with the institutional goals.

4. Curriculum

A. List any new courses or program changes since the last program review. Be sure to include if any new courses have approved prerequisites or co-requisites.

The following is a complete list of all of the EXISTING approved courses within the Earth Sciences Program currently listed in the Barstow Community College Catalog:

ASTRONOMY DEPARTMENT (ASTR):

ASTR 1 INTRODUCTION TO ASTRONOMY: 3 Units. Lecture: 3 hours. Principles of astronomy, including motions of the earth, time measurement, the solar system, stellar and galactic phenomena and cosmology. Star and constellation identification. Viewing of telescopic objects. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

ASTR 1L OBSERVATIONAL ASTRONOMY: 1 Unit. Lab: 3 hours. Prerequisite/Corequisite: Astronomy 1 with a "C" grade or better. Laboratory course which examines the major principles of astronomy, and utilizes observations through the telescope to explore the planets and moons of the solar system, stars, nebulas, and galaxies. Grades: Option (A- F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

GEOLOGY DEPARTMENT (GEOL):

GEOL 1L PHYSICAL GEOLOGY: 4 Units. Lecture: 3 hours; Lab: 3 hours. Introduction to the science of the earth with emphasis on: minerals and rocks, plate tectonics, volcanic activity, earthquakes, geologic processes which shape the earth's surface, and structure of the earth. The lab includes the identification of common rocks and minerals and the interpretation of geologic features from maps, aerial photos, and

field observations. One-day field trip required. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

GEOL 2 GEOLOGY OF CALIFORNIA: 3 Units. Lecture: 3 hours. An introduction to the development of California's varied landscape with emphasis on the geologic features of the state and their relationship to large-scale crustal movement (plate tectonics) of western North America. Special consideration will be given to the occurrence and distribution of earthquakes in the state. One-day field trip required. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

GEOL 3 NATURAL DISASTERS: 4 Units. Lecture: 3 hours; Lab: 3 hours. A study of the inter-relationship between man and his geologic environment, focusing on the causes and consequences of such natural hazards as earthquakes, volcanic eruptions, landslides, and flooding. The lab includes the interpretation and investigation of geologic hazards from topographic maps and field observations. One-day field trip required. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

GEOL 4 THE AGE OF DINOSAURS: 3 Units. Lecture: 3 hours. The historical geology and paleontology of the Mesozoic era including dinosaur evolution, ecology, lifestyles, habitat and extinction. Current controversies in dinosaur research will also be discussed. One-day field trip required. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

GEOL 5 FOSSILS AND THE HISTORY OF LIFE: 4 Units. Lecture: 3 hours; Lab: 3 hours. An introduction to the study of fossils. Evolution of animals and plants and their role in the interpretation of the geological history of the earth. Fossil preservation, distribution and paleoecology. One field trip is required. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

OCEANOGRAPHY DEPARTMENT (OCEA):

OCEA 1 INTRODUCTION TO THE MARINE ENVIRONMENT: 3 Units. Lecture: 3 hours. The ocean and its effect on the Earth's weather, its size and diversity of contained life forms and its contributions to the physical and historical development of man. The ocean's impact on geographical and economic matters. The impact of oceanic pollutants and potential exploitation of marine resources. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

PHYSICAL SCIENCE DEPARTMENT (PHSC):

PHSC 1 PHYSICAL SCIENCE FOR GENERAL EDUCATION: 4 Units. Lecture: 3 hours; Lab: 3 hours. Basic principles of physics to tie geology, chemistry, meteorology, and astronomy into one logical and meaningful structure. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

PHSC 2 INTRODUCTION TO EARTH SCIENCE: 3 Units. Lecture: 3 hours. Introduction to geology, astronomy, meteorology, climatology, and oceanography. Earth’s place in the universe. Scientific method and tools of scientific investigation. Grades: Option (A-F), P/NP. Degree Applicable Credit. Area of Emphasis and Gen Ed Applicable. UC/CSU

Prerequisites Summary:

1. Prerequisites: Astronomy (1; 100%), Geology (0; 0%), Oceanography (0; 0%), Physical Science (0; 0%).
2. Co-requisites: Astronomy (1; 100%), Geology (0; 0%), Oceanography (0; 0%), Physical Science (0; 0%).
3. Advisory: Not applicable

New Courses:

No new courses have been added since the last Regular Program Review Cycle in 2012.

B. Verify currency of curriculum: Other than above, what changes have been made in the curriculum since the last full program review? (*Updates, delivery mode changes, archives, deletions, revisions, etc.)*

a) Due to Chancellor's Office requirements, Methods of Instruction that align with the Course Objectives were added to the Course Outlines of Record for all of the courses in the Earth Sciences Program.

b) Validation of Prerequisites for all courses in the Natural Sciences occurred.

c) Student Learning Outcomes, Course Objectives, and Content were reviewed and revised with updated information, when necessary, for all of the Course Outlines of Record for every course in the Program.

d) GEOL 1L, Physical Geology has been significantly revised to facilitate alignment with the approved C-ID Descriptor (Curriculum Approval: Oct. 2, 2015)

e) GEOL 4, The Age of Dinosaurs, was reviewed for completeness, and CI-D Descriptor alignment. Since no C-ID Descriptor currently exists for this course, no action was taken.

1) *CURRICULUM CURRENCY: Verify that all Transfer Level Courses are current and aligned for transfer.* *(May require reviewing ASSIST or meeting with Articulation Officer.)*

All Transfer Level Courses in the Program are current and presently aligned for transfer.

2) *CURRICULUM DEVELOPMENT: Verify that all textbooks on Course Outlines of Record (COR) are up to date. Normally, textbook editions should be within five years for articulation.* *(Contact Articulation Officer for additional information.)*

With one exception, all textbooks on all of the Course Outlines of Record are up to date. The one exception is the textbook for GEOL 4, The Age of Dinosaurs. The textbook for this course has a 2007 publication date, but still represents the best resource by far for the class. An explanation will be submitted to our Articulation Officer for this text, so that this can be requested for approval.

C. List any courses not in full compliance with appropriate guidelines, including ASSIST, C-ID, Curriculum Committee, prerequisite validation, etc. *(NOTE: Any courses that have not been updated in the past six years may not be in compliance. See Curriculum Manual or Articulation Officer for additional information, if necessary.)*

All courses are being evaluated for C-ID Descriptor alignment. Although this is a VOLUNTARY program, and does not negatively affect current articulation of any of the courses, the Earth Science Program is committed to participating in the C-ID Descriptor program as a way of improving articulation of it courses in the future.

D. Curriculum Development: What is the plan for maintaining the currency and viability of your curriculum *(including all modes of delivery)*?

The following two curriculum changes are being considered for the near future:

The Earth Sciences Program is currently working on developing an additional Astronomy lecture course (ASTR 2) covering an examination of the planets. This three-unit course would be delivered in a traditional (Live) format to offer better opportunities with hands-on experiential studies for the students, and to increase the utilization of our Telescopic Observatory.

The feasibility of a Historical Geology course is also being explored. This class would be a 4-unit Laboratory course, and would have GEOL 1L, Physical Geology, as a prerequisite. This course would represent the second in a series of two Major courses available to students that are considering transferring to a Four-year College or University to attain a Bachelor's Degree in Geology.

The Earth Sciences Program remains committed to developing the necessary courses to meet the needs of general education students as well as others with diverse interests in the earth sciences. In addition, we are interested in providing the introductory courses needed for those students wishing to transfer to a Four-year College or University to major in one of the four departmental areas of Earth Science - Astronomy, Geology, Oceanography or Physical Science.

5. Internal Factors *(see Handbook for additional information)*

A. Strengths: *Current aspects of the program or department that serve it and its future well. These aspects include what it does well, what it's known for, what it takes pride in, and so forth. Strengths represent competencies or characteristics that the department or program may wish to enhance or preserve actively, even aggressively.*

The following strengths have been identified in the Earth Sciences Program:

1) <u>Curriculum and Course Delivery</u>:

a. Course are offered both online and through traditional methods of instruction.

b. Convenient scheduling – mixture of daytime, evening and online course offerings.

c. Live Courses are offered in 18-week sessions.

d. Online courses are offered over three-different staggered 9-week sessions each semester to meet student needs.

e. Diversity of Courses offered. A major strength within the program lies in the diversity of the courses offered. There are courses in all of the fields of Earth Science including Geology, Astronomy, and Oceanography. In addition, there is a general introductory course in Earth Science (PHSC 2) that gives non-majors a very broad introduction to all of the Earth Science subjects.

f. Two-Year Scheduling. Earth Science courses are offered on a timely schedule that allows the student to plan for a two-year program. Introduction to Earth Science (PHSC 2) gives non-majors a very broad introduction to all of the earth science subjects, and is offered each semester. We offer GEOL 1L, Physical Geology, and OCEA 1, Introduction to the Marine Sciences, once each year. Some of the other geology courses are offered on a two-year cycle. Our most popular course is ASTR 1, Introduction to Astronomy. We offer one live section of this course and THREE online sections each semester. It is also offered during the summer. With the opening of our new Astronomical Observatory and Telescope six years ago, ASTR 1L, Observational Astronomy, has been very successful with full enrollments each and every semester.

2) Quality Instruction:

a. Experienced/Skilled/Active Full-time instructor. The Full-time Instructor has been teaching in every Earth Science department for the last 17 years and employs many different learning techniques and styles of Instruction. This instructor has also been very active and involved with every aspect of the Program as is detailed below.

b. State of the Art Computers and Software in the Earth Sciences. All of the computers in the Earth Science Classroom were replaced, and all of the Earth Science Software was updated with new versions in 2014.

c. Hands-on Experiential Learning. All of the courses in the Earth Sciences Program either have Laboratories or hands-on experiential activities associated with them.

d. One-on-One (close) Interaction with Instructor. The Earth Science Laboratory courses create a unique environment for close student-student and student-instructor interactions, and are a definite advantage that the sciences have over many other disciplines. Our small class size in the traditional live delivery courses also contributes to these close interactions.

e. Outside-the-Classroom Learning Activities. Learning opportunities outside the classroom include field trips and travel. All of our Geology courses involve field trips to local geological sites. These include travel to Rainbow Basin National Landmark, the Mojave National Preserve, Amboy Crater National Landmark, and Pisgah Crater. Our GEOL 4 course has students visit the Los Angeles County Natural History Museum in Los Angeles. And the Astronomy courses regularly utilize our new Astronomical Observatory that involves travel to the Telescope site during class time.

3) Leadership within Program:

The Full-time Instructor in the Earth Science Program has taken a definite leadership role and has personally completed the following accomplishments within the discipline during the last Program Review period:

a) Assessed Student learning Outcomes at the Course, Department and Program Levels and implemented needed changes as a result: 2012-2015

b) Provided information input for the last Regular (full) Natural Science and Math Program Review (2012), as well as the annual Natural Science and Math Program Review Updates for each of the last two years (2013-2014 and 2014-2015) for the Earth Science Department including each of the following disciplines: Geology, Astronomy, Oceanography, and Physical Science.

c) Evaluated three part-time adjunct instructors in the Astronomy Department: 2012 -2014.

d) Managed budgets and purchased new and replacement equipment/ supplies for the Astronomy, Geology, Oceanography and Physical Science departments for the last three years. This included purchases for equipment and supplies for Geology Laboratory Activities and Field Trips: 2012-2015

e) Researched, wrote proposal, and drafted Budget Allocation Proposal (BAP) for replacement of ALL computers (17) in Earth Science Department Laboratory Classroom (T14): Fall 2012.

f) Researched, wrote proposal, and drafted Budget Allocation Proposal (BAP) for significant Upgrade and Update of ALL computer software programs (15) for Earth Science Department Laboratory Classroom (T14): Fall 2012.

g) Supervised two major and three minor repairs to the Astronomical Observatory: 2012-2014.

h) Performed repairs and replaced parts on main 16" Schmidt- Cassegrain Reflecting Telescope located in BCC Astronomical Observatory: 2012-2015.

i) Collimated (aligned) 16" Schmidt-Cassegrain Reflecting Telescope in Astronomical Observatory. Periodic Collimation is necessary due to regular use: April 2015.

j) Upgraded 16" Schmidt-Cassegrain Telescope and Pier located in BCC Astronomical Observatory by installing Dew Shield, Eyepiece Holder, Equipment Hook, and Equipment Shelf: 2013-2015

k) Purchased New Astronomy Supplies and Equipment for our Astronomical Observatory and Telescope including an assortment of high-grade Eyepieces and Filters: 2012-2015

l) Individually Tutored, on a weekly basis, a total of 18 students in the areas of Geology, Astronomy, Oceanography, and Physical Science over the three years of the review period: 2012-2015.

m) Wrote 27 Letters of Recommendation for students from courses in the Earth Science Program for College Admissions/Scholarships/Employment Applications over the review period: 2012-2015

4) Facilities:

a) Co-Lab Science Laboratory. The Co-Lab has 16 stations that can accommodate up to 2 students each. There is Electricity, Water, Gas, and compressed Air at each Station. Each station also has a State-of-the-Art Computer that can be shared by two students. Teaching in the Co-Lab allows for more activity-based, hands-on, experiential learning to take place.

b) Astronomical Observatory. Our Astronomical Observatory that houses our 16" Schmidt-Cassegrain Reflector Telescope is now in its Sixth year of successful operation. It is used for instruction in all of our Astronomy courses and occasionally for the PHSC 2 course as well.

5) Community Service and Outreach to the Public:

a) Organized and Conducted the following Public Telescope Viewing Events at the BCC Astronomical Observatory for the Barstow Community:

I) Telescope Viewing of Jupiter and its Four Moons
Tuesday, March 19, 2013, 7:30 - 10:00 p.m.

II) Telescope Viewing of the Waxing Gibbous Moon
Thursday, November 14, 2013, 6:00 - 9:00 p.m.

III) Telescope Viewing of Mars
Thursday, April 24, 2014, 8:00 - 10:30 p.m.

IV) Telescope Viewing of a Solar Eclipse
Thursday, October 23, 2014, 2:30 - 4:30 p.m.

V) Telescope Viewing of Jupiter and its Four Moons
Thursday, April 16, 2015, 8:00 - 11:00 p.m.

VI) Telescope Viewing of the Supermoon Total Eclipse of the Moon
Sunday, September 27, 2015, 6:30 - 10:00 p.m.

b) Organized, led and conducted the following Week-End Geology Field-Trips:

I) Field Trip to Rainbow Basin and Owl Canyon
Saturday, December 1, 2012, 9:00 a.m. - 6:00 p.m.

II) Field-Trip to Pisgah and Amboy Crater Volcanoes
Saturday, November 23, 2013, 9:00 a.m. - 7:00 p.m.

c) Donated time at Desert Discovery Center, 2013-2014.

d) Identified Rock, Mineral and Fossil Specimens from 35 members of the Barstow Community (2012-2015)

6) Press and Recognition:
a) Full-Time Instructor Highlighted in "Profiles in Learning" campaign via Website and Posters displayed around campus. Emphasis was placed upon instructor's use of experiential learning (utilizing the Science Laboratory and Astronomical Observatory) to complement traditional book learning. 2012 - Present.

b) Full-Time Instructor and Program profiled in first issue of Career Focus Magazine. Article entitled "Teaching with a Passion" outlined instructor's focus on experiential, activity-driven, hands-on learning in the Earth Science Program. Attention was placed on the authentic assessment of learning from real-life settings such as Filed-Trips to local Geological sites. Fall 2013/Spring 2014.

CONCLUSION:

The overall general state of the Earth Science Program is that it is healthy, and has a positive and productive future ahead as it continues to grow. Our Astronomy Program, as highlighted in the College's 2011 Educational Master Plan, has become the most productive aspect of the Program, and projections within the plan tell us that there will be continued growth in this area. The Public Viewings with our Telescope at the Astronomical Observatory for the Barstow Community have become extremely successful generating crowds of at least 200 people each time. There has also been recent press and recognition of the Earth Science Program as highlighted above. All of the above factors have greatly contributed to the generally high Course Retention and Success Rates cited in Section 3.A of this Program Review. We are proud of these aspects of the Earth Science Program that have led to such great progress, recognition, and success.

B. Weaknesses: *The program or department's **internal** vulnerabilities. These are areas that, if not addressed, could become liabilities, or could contribute to an erosion of the department's capacities and future growth. They represent areas where the organization needs to improve if it is to be successful for the long term.*

1) Lower Enrollments in Geology Courses. Enrollments in Geology courses are lower than in the past as evidenced by the following: WSCH/FTEF Ratio (Efficiency): GEOL 1L: 154.05 GEOL 4: 285	

Fill Rate:
GEOL 1L: 0.63
GEOL 4: 0.59

In the past these numbers have been stronger so there is definite concern about this decline. Action will need to be taken during the next Program Review Cycle period to improve enrollments in the Geology courses.

2) Lack of Contact, Relationships and Involvement with Adjunct Faculty in the Program. Communication between Full-time and Part-time instructors in the Program is not occurring on a regular basis. This has caused problems with respect to participation from Adjunct faculty in Program Review and Accreditation processes, and other involvement in the Earth Science Program and the campus community as a whole.

3) Lack of Proper/Current Tools and Supplies for the Earth Science Courses. The Program is in need of newer and more effective Tools and Supplies for classroom instruction in all Departments of the Earth Sciences, but particularly in the Geology and Oceanography areas. Many consumable supplies for the Geology Laboratory courses must be replaced on an annual basis. In addition, many of the non-consumable tools and supplies for classroom instruction are not state-of-the-art, and should be replaced to keep the courses current and interesting for students. New Multi-Media and Audio/Visual Aids for the Earth Science Program are needed in order to enhance learning and the overall educational experiences for our students. Most of our Audio/Visual aids in the Oceanography Department are 25-30 years old, and are no longer appropriate to be utilized in the classroom.

Full-time:

6. External Factors *(see Handbook for additional information)*

A. Opportunities: *Current trends and events occurring **outside** the department that, if taken advantage of, are likely to have a positive effect on its long-term success. Examples may include: realistic training opportunities; industry trends; revenue-generation opportunities; development of new tools or technology to help manage workload.*

1) Expansion of C-ID Descriptors: The Course Identification Numbering System, funded by the California Community College Chancellor's Office, has developed Course Descriptors for the purpose of encouraging wider articulation and expanding the lower division curricular offerings and thereby increasing the variety—and ensuring the rigor—of Community College courses. Currently there is an expansion of the numbers of C-ID Descriptors within the Geology Discipline. We should take advantage of this great opportunity by aligning as many of our courses as possible.

2) Job Market: For students wishing to major in a field within the Earth Science Program, the current Job Market is excellent in most of the areas, but particularly in Geology, with demand far exceeding the numbers of applicants. Therefore, the job market, at this time, is a factor providing positive effects and opportunity for the continuing success of the Program. We usually encounter about 3 or 4 students per

year that are interested in pursuing Geology as a major upon transfer. We would like to see that number increase by promoting the current state of the Job Market in the profession.

From edd.ca.gov

Area	Title	Base	Projected	Change	% Change	A
California	Geoscientists	6,100	6,500	400	6.6	370

B. Threats: *Current trends and events occurring **outside** the department or program that could jeopardize its success represent potential threats. Examples may include: state, regional, or institutional economic/budget climate; loss of support services; seasonal fluctuations in workload.*

1) Budgetary Constraints: The Consumable and Non-Consumable supply budgets in most of our departments is far too small. The budget for each department In the Earth Sciences Program has been significantly reduced over the last five years. In Oceanography all budget accounts have been eliminated. This has placed a burden on the Earth Science Program especially since there are classes that use consumables that must be replaced yearly. Overall the cuts have created a significant challenge with respect to maintaining the quality and effectiveness of our instruction in all of the Earth Science areas, but particularly in the Oceanography Department. An increase in the supplies budget would allow the Geology and Oceanography courses to continue to offer quality laboratory experiences and activities to students at appropriate levels.

If not addressed, these reductions could become significant liabilities and could contribute to an erosion of the departments' capacities and future growth.

2) Requirements from State of California and Four-Year Institutions: Notification of any articulation changes have not always filtered down in an effective or timely manner; for example, the changes in CI-D Descriptor alignments for some science courses. Due to late notification or misinformation, some courses have been required to go back through the Curriculum Approval Process more than once in order to be offered again.

3) Online Course Maximum Enrollment Capacity. ASTR 1 Online classes are currently too large (capped at 50 students) to maintain quality instruction. It is virtually impossible to achieve Regular and Effective Contact with the students in these large classes. One-on-one interaction between the instructors and students has become difficult, if not impossible, to achieve. Examinations are usually limited to only Multiple Choice and True/False questions, as other formats, such as essays, are not feasible with such large classes. This severely limits the amount and types of assessment that can be done in these classes, whether it is for SLO measurement or for grading purposes.

7. Continuing Education/Professional Development

A. What continuing education and/or professional development activities have program/unit members attended during the current cycle?

For the Full-Time Faculty member in the Program the following types of Continuing Education and Professional Development activities occurred during the period since the last Regular Program Review:

1) Service as Academic Senate President:

a) Served as Academic Senate President at BCC from Fall 2012- Spring 2013, and again from May 2015 to present.
b) Attended break-out sessions and served as voting Delegate for the Fall 2012 Plenary Session of the State Academic Senate, San Diego, CA, November 2012.
c) Served as Math, Science and P.E. Division Representative, BCC Academic Senate, 2013-2104

2) Continuing Research in Field of Expertise:

a) Performed fieldwork and research on several dinosaur tracksites in northeastern Arizona during the summers of 2012 - 2014.
b) Working on a paper to submit for publication on Early Jurassic Dinosaur Footprints from the Kayenta Formation, Northeastern Arizona.
c) Currently writing a book on Theropod Dinosaur Tracks.

3) Membership and Service to Professional Organizations:

a) Member, Barstow College Faculty Association
b) Chief Negotiator, and Chair of Bargaining Team, BCFA
c) Member, California Teachers Association
d) Member, National Education Association
e) Member, American Association of Community Colleges
f) Member, Faculty Association of California Community Colleges
g) Member, Geological Society of America
h) Member, Society of Vertebrate Paleontology
i) Member, Astronomical Society of the Pacific

4**) All-College Meetings**: Barstow College has selected the first Tuesday of each month as All-College meetings designed for staff development, to raise student achievement, promote the college and enhance career readiness. These meetings are also designed to collectively disseminate and communicate the mission and master plan of the college through collaboration of faculty and administration.

5) All-Division/Best Practice Meetings: In addition, All-Division and Best Practice meetings are scheduled monthly. These meetings serve as great stages for faculty to get training on important processes at the college, including program review, and accreditation, to present reports on what they have learned from attending Professional Development meetings around the state, to demonstrate new or innovative teaching techniques, to share ideas about pedagogy, and to present the results of academic research. The meetings have become important venues in which to observe collegiality, cooperation, and collaboration among the BCC faculty.

B. How did this benefit your department and the College?

1) Service as Academic Senate President: Develop and enhance Leadership Skills, attend many Break-Outs/Conferences on Pedagogy and Teaching Techniques and Innovations.
2) Continuing Research in Field of Expertise: Maintain Professional Competence and Effectiveness in discipline.

3) Membership and Service to Professional Organizations: Maintain Currency in discipline.
4) All-College Meetings: Encourage current and future directions in curriculum, instructional methodology, technology, student services, and professional growth.
5) All-Division/Best Practice Meetings: Stimulate useful ideas to improve Institutional Effectiveness, creating a sense of oneness, motivating each other and reinforcing the goals of the Program and College.

C. What are the plans for continuing education and/or professional development in the upcoming cycle?

For the upcoming cycle, the Full-Time Faculty member in the Program intends to pursue continuing education opportunities, and attend professional development conferences/activities. Membership in all of the above Professional Organizations will continue. Attendance at All-College, All- Division and Best Practice meetings will also continue, as well as attendance at State Plenaries, Institutes, and Regional Meetings in connection with duties as Academic Senate President. Finally, research within the discipline will continue including working on a paper to submit for publication on Early Jurassic Dinosaur Footprints in Arizona, and writing a book on Theropod Dinosaur Tracks.

8. Prior Goals/Objectives

- Briefly summarize the progress your program has made in meeting the goals and objectives identified in the most recent Program Review or Annual Update. *(Include measurements of progress or assessment methods.)*
- If the program does not have prior goals and objectives, please explain.

Prior Goal #1: Provide students a successful college learning experience; aligns with Strategic Priority #2.

Prior Objective 1.1 Plan and implement programs based on learning needs and career paths.
Progress: The Curriculum in each department of the Earth Science Program has been evaluated, and Prerequisites have been reviewed. The Course Outline of Record for each course is up to date and in compliance. There are plans for the development and addition of new courses. Current career paths and the potential Job Market in each area have been analyzed and evaluated.

Prior Objective 1.2 Augment current and emerging technologies to foster student learning.
Progress: Success, retention, and fill rates for the online Astronomy classes are positive and very high. New State-of-the-Art Computers were installed in the Co-Lab Science Laboratory in the fall of 2014. All of the Earth Science Computer Software Programs in the departments of Geology, Astronomy, and Oceanography were also upgraded or replaced in the fall of 2014.

Prior Goal #2: Foster an innovative learning environment that respects diversity; aligns with Strategic Priority #1

Prior Objective 2.1 Offer programs and services for individual student populations.
Progress: The Program is currently in the process of reviewing all of its courses to ensure that there is agreement with the existing state-approved CI-D Descriptors. This will allow for even greater articulation of our courses for transfer students. Although the Transfer Rate for the College appears to be similar to the state average (BCC FactBook), the Numbers of Transfer students going to a UC campus are very low. We need to discover additional ways to make our students more competitive when transferring to a four-year institution.

Prior Objective 2.2 Advance a culture of inclusion that promotes and appreciates the human condition.

Progress: The Program is committed to providing innovative learning environments that respect diversity for students. Although we have made some real progress in providing/replacing antiquated or non-functional science laboratory equipment, there are still many situations where we are not using modern state-of-the-art tools and supplies. A lack of proper funding for the supply budgets in each department has put the Program at risk of not being able to deliver successful laboratory learning experiences for our students.

9. Goals/Objectives/Actions (ACTION PLAN)

A. GOALS: Formulate Program Goals to maintain or enhance program strengths, or to address identified weaknesses.

B. ALIGNMENT: Indicate how each Goal is aligned with the College's Strategic Priorities.

C. OBJECTIVES: Define Objectives for reaching each Goal.

D. ACTIONS/TASKS REQUIRED TO ACHIEVE OBJECTIVE: Create a coherent set of specific steps (Actions/Tasks) that must be taken to achieve each Objective.

E. OUTCOMES: State intended Outcomes and list appropriate measures and assessment methods for each Outcome.

F. ADDITIONAL INFORMATION: This area provides for the additional communication of information necessary to further "close the loop" on the goal or action plan, as it relates to Institutional Planning. This may include references to other institutional documents, such as governing or compliance documents (i.e. Board Policy, Administrative Procedures, Title V), institutional planning documents (i.e. Strategic Plan, Educational Master Plan, Facilities Plan, Technology Plan), or Board, Presidential, Supervisory or Departmental recommendations or goals, etc. *(See Handbook for additional examples.)*

Complete the following table with your Program's **ACTION PLAN**, which must include a **minimum of 3 goals**:

ACTION PLAN						
	GOAL	ALIGNMENT WITH BCC STRATEGIC PRIORITIES		OBJECTIVE	ACTIONS/TASKS REQUIRED TO ACHIEVE OBJECTIVE	OUTCOMES, MEASURES, and ASSESSMENT
#1	Increase Student Enrollment in Geology Courses	*List all that apply:* Strategic Priority #1: Educational Success - Measurably advance student equity, completion and attainment of educational goals. Strategic Priority #3: Fiscal Health - Sustain and cultivate an environment that strengthens the District's long-term fiscal health.	#1	To Promote the Geology Profession	Work with Counselors to promote and recommend Geology courses and Geology profession to students.	Increased Fill Rates in Geology courses.
			#2	To Enable Students to more efficiently satisfy their educational goals (Natural Science Requirements).	Advertise the Geology courses and Geology profession (flyers).	Increased enrollment numbers in Geology Courses.
			#3	To Expand and Enhance the Geology Department with more course offerings and opportunities for students.	Work with PIO Director to promote the Geology Program and Geology Profession.	Increased WSCH/FTEF Ratio (Efficiency) in Geology courses.
	Additional Information:	Why just Geology? WSCH/FTEF Ratio (Efficiency) and Fill Rates were lower than average for the Geology courses only.				
#2	Increase Contact, Relationships and Involvement with Adjunct faculty in the Program	*List all that apply:* Strategic Priority #1: Educational Success - Measurably advance student equity, completion and attainment of educational goals.	#1	To Increase the number of planned and scheduled faculty conversations and interactions with Adjunct Faculty in the Program.	Obtain a list and contact information (phone and E-mail) for all Part-Time Faculty teaching in the Earth Sciences Program.	Documented All-Program faculty meetings.

ACTION PLAN						
	GOAL	ALIGNMENT WITH BCC STRATEGIC PRIORITIES		OBJECTIVE	ACTIONS/TASKS REQUIRED TO ACHIEVE OBJECTIVE	OUTCOMES, MEASURES, and ASSESSMENT
		Strategic Priority #5: Campus Culture - Build a diverse and committed campus culture that promotes engagement among students, staff, faculty, the college and the community. Strategic Priority #7: Diverse and Excellent Workforce - Attract, develop, and retain an excellent and diverse workforce.	#2	To Increase discussion and dialogue between Full-Time and Part-Time faculty of the Earth Science Program.	Contact and Set-up meetings with Adjunct Faculty	Minutes from All-Program faculty meetings.
			#3	To Increase involvement of Part-Time faculty within the Program and in the campus community.	Create Agenda for Meetings with Adjunct Faculty	Evidence of participation from Adjunct faculty in Program Review and Accreditation processes, and other involvement in the Program and campus community.
	Additional Information:	Possible Additional Action/Task: It might be helpful to have the full-time faculty member mentor the two part-time faculty instructors.				
#3	Promote a high quality Laboratory classroom environment for Earth Science learners with the appeal of a multi-faceted learning approach.	*List all that apply:* Strategic Priority #1: Educational Success - Measurably advance student equity, completion and attainment of educational goals. Strategic Priority #3: Fiscal Health - Sustain and cultivate an environment	#1	To Utilize newer and more effective Tools and Supplies in the Earth Science courses.	Purchase new Laboratory Tools and Supplies for the Earth Science Program by submitting Requisitions to Academic Affairs Office.	Assessment of measurement of Course Level Outcomes (SLOs) and Program Level Outcomes (PLOs).
			#2	To Create more Learning Environments and Interdisciplinary teaching experiences in the Program.	Discuss with other Science colleagues the possibility of team-teaching the PHSC 1 - Physical Science for General Education - course.	Increased Retention (Completion) Rates for the courses in the Earth Science Program.

ACTION PLAN						
GOAL		ALIGNMENT WITH BCC STRATEGIC PRIORITIES	OBJECTIVE		ACTIONS/TASKS REQUIRED TO ACHIEVE OBJECTIVE	OUTCOMES, MEASURES, and ASSESSMENT
		that strengthens the District's long-term fiscal health.	#3	To Provide more Multi-Media and Audio/Visual experiences for students in the Earth Science courses.	Purchase new Multi-Media and Audio/Visual Aids for the Earth Science Program by submitting Requisitions to Academic Affairs Office.	Increased Success Rates for the courses in the Earth Science Program.
	Additional Information:	Priority #1: Most of our Audio/Visual aids in the Oceanography Department are 25-30 years old.				

10. Resources Required

List all significant resources needed to achieve the objectives shown in the table above, including personnel, training, technology, information, equipment, supplies, and space. Every request for additional resources must support at least one objective.

Also list any resources required to implement planned improvements noted in 3.C.3)

IMPORTANT: A BUDGET ALLOCATION PROPOSAL must be completed and submitted for EACH new resource requested.

Goal #	Objective #	Resource Required	Estimated Cost	BAP Required? Yes or No	If No, indicate funding source
		None Requested			