INSTRUCTION PROGRAM REVIEW: SPRING 2013 SUBMISSION CYCLE

Program Name: Astronomy
Academic Year: 2013-2014
Faculty Contact: Darryl Stanford
Program Review Submission Date: 3/25/2013

I. Description of Program

Provide a brief description of the program and how it supports the college's College Mission and Diversity Statements, Institutional Priorities, 2008-2013, 5 in 5 College Strategies, Spring 2011, and other institutional planning documents as appropriate.

The Astronomy Department offers labs and courses in introductory astronomy. These courses and labs enable students to discover and critically analyze the universe around them. The student will get a basic understanding of the universe and all that is contained within it. More advanced students can use the observatory to pursue independent research on spectroscopy and photometry. All of the courses and labs are UC and CSU transferrable.

II. Summary of Student and Program Data

A. Student Learning Outcomes Assessment

Summarize recent SLO assessments, identify trends, and discuss areas in need of improvement.

Assessments are ongoing. Here are some results from ASTR 115 Solar System Astronomy:
SLO 1: Explain the reason for the seasons.
90% of the students got that answer correct.

SLO 2: Analyze the role of tectonics in shaping the surfaces of the terrestrial planets.
78% of the students got that answer correct.

SLO 4: Contrast the similarities and differences of the major solar system moons.
76% of the students got that answer correct.

In each case, the assessment method was a passing grade of 70% on a 50 question multiple choice exam. Apparently SLO 1, was easiest for the students, because it is not difficult for them to relate to the seasons. However, SLO 2 was somewhat more difficult, because students must first understand what the word 'tectonics' means with respect to the Earth and apply it to the other terrestrial planets. SLO 4 was also somewhat difficult, since students had to remember a number of moons as well as their characteristics. I think spending a bit more time on these topics, and discussing them in more detail, may lead to deeper understanding.

B. Student Success Indicators

1. Review Student Success and Core Program Indicators and discuss any differences in student success indicators across demographic variables. Also refer to the College Index and other relevant sections of the Educational Master Plan: Update, 2012, e.g., Student Outcomes: Transfer. Basic Skills programs should also refer to ARCC data.

Astronomy	Retention(%)	Success(%)
2009-10	87	71
2010-11	86	71
2011-12	89	72

College	Retention(%)	Success(%)
2009-10	85	70
2010-11	84	69
2011-12	85	71

Math/Science	Retention(%)	Success(%)
2009-10	82	66
2010-11	81	66
2011-12	83	67

As can be seen from the data above, Astronomy has exceeded both the retention and success figures for the Math/Science division and college for the years 2009-12.
Pacific Islander students have amongst the highest success rate in astronomy, 81%. This is greater than the Math/Science Division's figure of 58% and the college's value of 66%, for the 2011-12 year. Filipino students succeeded at the rate of 75%, compared to 69% for Math/Science Division and 69% for the college, for the 2011-12 year. The rate for Hispanic students was 68%, 62% and 66% respectively. The rate for white students was 75%, 70% and 74% respectively, for the 2011-12 year. Black students accounted for only 3% of Astronomy's total enrollment, but had a success rate of 63%, compared to 52% for Math/Science Division and 62% for the college, for the 2011-12 year. The number of Black students is unfortunately very low, as is the case all across the board for Math/Science Division and the college. However, Black students are sorely underrepresented in Astronomy. This is partly due to lack of role models as well as insufficient exposure to the science. I do, however, see many Black families coming to our planetarium shows, Project Star Gaze, and Jazz Under the Stars events. Hopefully, this exposure will help to increase the numbers.

2. Discuss any differences in student success indicators across modes of delivery (on-campus versus distance education). Refer to Delivery Mode Course Comparison.

The online course has been successful. The enrollment was 111 students in Fall 2011. The retention rate is 67.6%, compared to 63.7%, summing over all traditional astronomy courses. The retention rates are comparable: 91% for the online course compared to 90% for the traditional course.

C. Program Efficiency Indicators. Do we deliver programs efficiently given our resources?

Summarize trends in program efficiency as indicated in the Student Success and Core Program Indicators (LOAD, Full-time and Part-Time FTEF, etc.).

LOAD in Spring 2011 was 1085, the highest in three years. The success rate has remained constant, at 73%, and the retention has remained constant at 88.2%. The withdrawal rate is 11.8%, amongst the lowest in three years. The comparable figures for the college as a whole are as follows: success, 69% and retention, 84%. Full-time FTEF has remained constant at 2.2 and the adjunct FTEF has increased to 1.6. Overall, the Astronomy Department is doing very well in retaining and enabling students to succeed.

D. Course Outline Updates

Review the course outline update record**.** List the courses that will be updated in the next academic year. For each course that will be updated, provide a faculty contact and the planned submission month. See the Committee on Instruction website for course submission instructions. Contact your division's COI representatives if you have questions about submission deadlines. Career and Technical Education courses must be updated every two years.

Courses to be updated	Faculty contact	Submission month
ASTR 125	Darryl Stanford	May 2013

E. Website Review

Review the program's website(s) annually and update as needed.

Faculty contact(s)	Date of next review/update
Darryl Stanford	Website is updated constantly.

F. Additional Career Technical Education Data – CTE programs only. (This information is required by California Ed. Code 78016.)

1. Review the program's Gainful Employment Disclosure Data, External Community, and other institutional research or labor market data as applicable. Explain how the program meets a documented labor market demand without unnecessary duplication of other training programs in the area. Summarize student outcomes in terms of degrees, certificates, and employment. Identify areas of accomplishment and areas of concern.

Click here to enter Gainful Employment Disclosure Data narrative

2. Review and update the program's Advisory Committee information. Provide the date of most recent advisory committee meeting.

Click here to update the Advisory Committee information

III. Student Learning Outcomes Scheduling and Alignment

A. *Course SLO Assessment*

Explain any recent or projected modifications to the course SLO assessment process or schedule.

There are no recent or projected modifications to the course SLO assessment process or schedule, other than the ASTR 125 assessment, which will be completed in May 2013.

B. *Program SLO Assessment*

Explain any recent or projected modifications to the program SLO assessment process or schedule.

Since the Astronomy Department does not yet offer a degree in astronomy, we do not have a Program SLO.

C. *SLO Alignment*

Discuss how Course SLOs support Program SLOs. Discuss how Course and/or Program SLOs support Institutional/GE SLOs. Refer to TracDat related Program and Institutional SLO reports.

All of the Astronomy Course SLOs support the CSM General Education SLOs, Critical Thinking and Quantitative Skills. As an example of Quantitative Skills, Astronomy students routinely analyze data relationships and interpret graphical representations of quantitative information when analyzing the Hertzsprung-Russell (HR) diagram. This diagram plots a star's luminosity vs. its surface temperature, enabling students to determine a star's mass and lifetime. As an example of Critical Thinking, Astronomy students contrast the merits and disadvantages of both the Ptolemaic and Copernican views of the universe. They evaluate the successes of both Tycho Brahe and Galileo's observations.

IV. Additional Factors

Discuss additional factors as applicable that impact the program, including changes in student populations, state-wide initiatives, transfer requirements, advisory committee recommendations, legal mandates, workforce development and employment opportunities, community needs. See Institutional Research as needed.

The main factor impacting the program is the money needed to maintain the service contracts on our planetarium equipment. As this report is written, Astronomy has just received word that our maintenance contract is in the process of being extended for five more years.

V. Institutional Planning

A. *Results of Plans and Actions*

Describe results, including measurable outcomes, from plans and actions in recent program reviews.

As a result of the last program review, we purchased an FLIR camera. This was used in a number of demonstrations and experiments in the classroom and the lab. For instance, the camera allowed students to see themselves in the infrared portion of the electromagnetic spectrum. They were able to see the different temperatures of their hair, skin, clothes, etc. This showed them how different parts of their bodies can be at different temperatures.

Clickers are now being used in all of our lectures, as a result of a rental agreement between the bookstore and the clicker company. Clickers are allowing us to increase student to student and faculty to student interaction. Students love using them, since it allows them to compete with their friends, as to who knows the correct answer. Faculty love using clickers because they allow them to really see if the students understand the material. It also allows faculty to hear from students, who are normally reticent to express their opinion.

B. *Program Vision*

What is the program's vision for sustaining and improving student learning and success during the *next six years*? Make connections to the College Mission and Diversity Statements, Institutional Priorities, 2008-2013, and other institutional planning documents as appropriate. Address trends in the SLO assessment results and student success indicators and data noted in Section II. Summary of Student and Program Data.

[*Note*: CTE programs must address changes in the context of completion and employment rates, anticipated labor demand, and any overlap with similar programs in the area as noted in Sections II.F.1 and II.F.2.]

[*Note*: Specific plans to be implemented in the *next year* should be entered in Section V.C.]

The Astronomy Department now has an Astroimaging and Observatory Operation (AOOC) Certificate, recently approved by the California state review board. The AOOC program is designed such that, upon completion, students are qualified to operate any observatory, and apply various imaging techniques to gather and analyze astrophysical data. With minimal modification, students can apply their course load for this program toward a BS degree in astronomy or astrophysics upon transfer to any four-year institution that offers such a degree. Bay Area colleges and universities, as well as professional observatories, are in need of qualified technicians that can operate telescopes and various imaging devices to collect astrophysical data and advance the field of astronomy. For instance, a graduate of this program is well equipped to operate the telescopes at Stanford University or San Francisco State University. There is a high demand for such technicians and there are very few institutions that can train the students in this field. The College of San Mateo Astronomy Department, with its roll off roof observatory and trained staff and faculty, is in a unique position to fulfill that need.

1. To guide future faculty and staff development initiatives, describe the professional enrichment activities that would be most effective in carrying out the program's vision to improve student learning and success.

The Astronomy Department is interested in pursuing Reading Apprenticeship. We believe it would be important in ascertaining how well Astronomy students comprehend their textbook.

2. To guide future collaboration across student services, learning support centers, and instructional programs, describe the interactions that would help the program to improve student success.

We like the Supplemental Instruction (SI) Program, implemented by mathematics Professor Lena Feinman during flex day and hope that it can be instituted for the Astronomy program. We can see how a student, who has gone through a particular class, can indeed improve the success of other students, who are having difficulty, in that class.

3. To guide the Institutional Planning Committee (IPC) in long-range planning, discuss any major changes in resource needs anticipated in the *next six years*. Examples: faculty retirements, equipment obsolescence, space allocation. Leave sections blank if no major changes are anticipated. Specific resource requests for the next academic year should be itemized in Section VI.A below.

Faculty:

We would like to hire a full time faculty member during the next few years. We have just instituted a new certificate program, the Astroimaging and Observatory Operation (AOOC) Certificate program. The AOOC program is designed such that, students are qualified to operate any observatory, and apply various imaging techniques to gather and analyze astrophysical data. To fully implement this program and to address our increasing enrollment, a full time faculty member is needed.

Equipment and Technology:

The digital video projectors in our planetarium are aging and are becoming outdated. Within the next two to three years, the manufacturer will no longer support any maintenance agreement for D3 projectors. We hope to update them, within the next few years, with higher resolution projectors. Our present video projectors project an image with a fulldome resolution of 2K x 2K pixels, which is relatively low resolution. We anticipate going to video projectors, which can project 4K x 4K worth of date onto our dome. This increased resolution will give sharper, more realistic images and is more in keeping with our state-of-the-art facility. In addition, we hope to purchase new planetarium shows, to update our present selection. It is extremely important for us to purchase full dome content, reflecting the latest advances and discoveries in astronomy.

Instructional Materials:

While our 20 Mac computers for the astronomy labs are presently fine, it is anticipated that they will need replacement in within the year, due to obsolescence. Some of our observatory computers are also old and need of replacement. These computers are being used by our Special Projects students and by students, who will be in our Astroimaging and Observatory Operation (AOOC) Certificate program. Here is a breakdown on what we will need:

For the Astronomy labs:

1. 20 new MacBook computers for the astronomy labs. However, we do not need a cart, since we have a spare, unused cart.

For students in the Special Projects class and those in the Astroimaging and Observatory Operation (AOOC) Certificate program:

1. 1 PC desktop computer to run our 20" telescope in the observatory. The one presently in use is slow and outdated for our purposes.
2. 1 PC laptop to be used as a portable imaging and image processing computer. Its versatility will allow it to be used on various telescopes, as the need arises
3. 1 PC laptop to be used with our spectroscopy telescope. The present computer is outdated and runs very hot.
4. 1 PC laptop for our astronomy technician to use in his office. He is presently using his own PC laptop to do astronomical processing and create nightly observing lists.

Classified Staff: 5T

Facilities: 5T

C. Plans and Actions to Improve Student Success

Prioritize the plans to be carried out next year to sustain and improve student success. Briefly describe each plan and how it supports the Institutional Priorities, 2008-2013. For each plan, list actions and measurable outcomes.

Plan 1

Title

Solar and Stellar Spectroscopic Observations

Description

Observational Astronomy 103 Lab and astronomy 101 lab students will now be able view and analyze spectra of the sun and other stars. In addition, this equipment will support our new Astroimaging and Observatory Operation (AOOC) Certificate program.

Action 1	Completion Date	Measurable Outcome(s)
Observe the sun's Fraunhofer lines and the Zeeman Effect on sunspots.	Ongoing	Students will complete several solar observing labs

Action 2	Completion Date	Measurable Outcome(s)
Observe stellar spectral absorption lines and determine the elements they represent.	Ongoing	Students will complete several stellar spectral labs

Plan 2

Title

Emission Line Spectra observations

Description

Observational Astronomy 103 Lab and astronomy 101 lab students can now continue to be able to observe and analyze emission line spectra of typical gas tubes. Several of our tubes have deteriorated and new ones are needed. In addition, another power supply will allow students to view the spectra of an additional 'unknown' gas.

Action 1	Completion Date	Measurable Outcome(s)
Observe emission line spectra of various gases.	Ongoing	Students will complete several spectroscopy labs

Plan 3

Title

Special Projects Student Research and Support of our New Astroimaging and Observatory Operation (AOOC) Certificate Program

Description

Special projects students conduct original research in imaging of nebulae and galaxies, stellar spectroscopy, and photometry of exoplanets, pulsating variable stars and eclipsing binaries. In addition, our new astroimaging certificate program will benefit from getting a new color camera for imaging, a new refractor for visual observing, and other equipment for updating our observatory's facilities.

Action 1	Completion Date	Measurable Outcome(s)
Special projects students complete their projects.	Ongoing	Students are able perform research, using our state-of-the-art equipment. They submit a report at the end of the semester o their research.

Action 2	Completion Date	Measurable Outcome(s)
Students complete the requirements for their astroimaging certificate	Ongoing	Our certificate program will begin in Spring 2014.

For additional plans, cut/paste from above and insert here. Or add an additional page. Number your additional plans accordingly.

[Note: Itemize in Section VI.A. Any additional resources required to implement plans.]

VI. Resource Requests

A. Itemized Resource Requests

List the resources needed for ongoing program operation and to implement the plans listed above.

Faculty

Full-time faculty requests (identify specialty if applicable)	Number of positions
Full time Astronomy faculty position	One

Complete Full-Time Faculty Position Request Form for each position.

Description of reassigned or hourly time for prioritized plans	Plan #(s)	Cost

Equipment and Technology

Description (for ongoing program operation)	**Cost**
Solar and Stellar Spectroscopic Observations Observational Astronomy 103 Lab and astronomy 101 lab students will now be able view and analyze spectra of the sun and other stars. In addition, this equipment will support our new Astroimaging and Observatory Operation (AOOC) Certificate.	Cost **$2,424.00**
Shelyak Alpy 600 Spectrograph Lhires Lite visual spectroscope **Total**	$ 759.00 $1,665.00 **$2,424.00**

Description (for prioritized plans)	**Plan #(s)**	**Cost**
Observational Astronomy 103 Lab and astronomy 101 lab students will now be able view and analyze spectra of the sun and other stars. In addition, this equipment will support our new Astroimaging and Observatory Operation (AOOC) Certificate.	1	**$2,424.00**

Description (for ongoing program operation)	Cost
Special Projects Student Research and Support of Our New Astroimaging and Observatory Operation (AOOC) Certificate Program Special projects students conduct original research in imaging of nebulae and galaxies, stellar spectroscopy, and photometry of exoplanets, pulsating variable stars and eclipsing binaries. In addition, our new astroimaging certificate program will benefit from getting a new color camera for imaging, a new refractor for visual observing, and other equipment for updating our observatory's facilities.	Cost **$9,940.00**
Eprom chip upgrades for Losmandy Gemini mounts	$ 150.00
Color CCD Self guiding camera STF-8300C w/Color ST-I camera	$3,495.00
Losmandy replacement motor SVM-HT	$ 225.00
MKS 4000 adapter panel & homing sensor cable assembly for Paramount ME	$ 675.00
Explore Scientific 127 mm f/7.5 apo refractor	$2,200.00
Losmandy G-11 mount w/Gemini 2 GoTo Mount	$3,195.00
Total	**$9,940.00**

Description (for prioritized plans)	Plan #(s)	Cost
Special projects students conduct original research in imaging of nebulae and galaxies, stellar spectroscopy, and photometry of exoplanets, pulsating variable stars and eclipsing binaries. In addition, our new astroimaging certificate program will benefit from getting a new color camera for imaging, a new refractor for visual observing, and other equipment for updating our observatory's facilities.	3	**$9,940.00**

Instructional Materials

Description (for ongoing program operation)	**Cost**
Emission Line Spectra Observations Observational Astronomy 103 Lab and astronomy 101 lab students can now continue to be able to observe and analyze emission line spectra of typical gas tubes. Several of our tubes have deteriorated and new ones are needed. In addition, another power supply will allow students to view the spectra of an additional 'unknown' gas.	Cost **$789.95**
Edmund Scientific gas tubes: Hydrogen Helium Neon Mercury Edmund Scientific Spectrum Analysis Power Supply Orion Redbeam II flashlights 20 @ $25 **Total**	 $ 20.00 $ 20.00 $ 20.00 $ 20.00 $159.95 $550.00 **$789.95**

Description (for prioritized plans)	**Plan #(s)**	**Cost**
Observational Astronomy 103 Lab and astronomy 101 lab students can now continue to be able to observe and analyze emission line spectra of typical gas tubes. Several of our tubes have deteriorated and new ones are needed. In addition, another power supply will allow students to view the spectra of an additional 'unknown' gas.	2	**$789.95**

Classified Staff

Description (for ongoing program operation)	Cost

Description (for prioritized plans)	Plan #(s)	Cost

Facilities

For immediate or routine facilities requests, submit a CSM Facility Project Request Form.

Description (for prioritized plans)	Plan #(s)	Cost

B. Cost for Prioritized Plans

Use the resources costs from Section VI.A. above to provide the total cost for each plan.

Plan #	Plan Title	Total Cost
1	Solar and Stellar Spectroscopic Observations	$2,424.00
2	Emission Line Spectra observations	$789.95
3	Special Projects Student Research and Support of our New Astroimaging and Observatory Operation (AOOC) Certificate Program	$9,940.00