College of San Mateo — Program Review Submission

2014-2015 Instructional Program Review

Program Name: **Astronomy**
Program Contact: **Stanford, Darryl**
Academic Year: **2014-2015**
Status: **Submitted for review**
Updated on: **03/31/2015 01:59 PM**

1. Description of Program

Provide a brief description of the program and how it supports the college's **College Mission and Diversity Statements**, **Institutional Priorities, 2013/14-2015/16**, **5 in 5 College Strategies, Spring 2011**, and other **Institutional Program Planning** as appropriate.

The Astronomy Department offers the following courses in astronomy:

At the 100 level: ASTR 100 Introductory Astronomy, ASTR 125 Stars, Galaxies and Cosmology, and ASTR 115 Solar System Astronomy,

At the 200 level: ASTR 200 Introduction to Astrophysics, ASTR 203 Astroimaging Techniques, and ASTR 204 Application of Astroimaging Techniques.

The Astronomy Department also offers the following labs in astronomy at the 100 level: ASTR 101 Astronomy Lab and ASTR 103 Observational Astronomy Lab.

Taking the introductory courses and labs allows the student to get a basic understanding of the universe and all that is contained within it, as well as helping to satisfy general education requirements. More advanced students use the observatory to pursue independent research on spectroscopy, photometry, and astroimaging. All of the courses and labs are UC and CSU transferrable.

We are also continuing to take the first steps in our Astroimaging and Observatory Operation certificate program. The Introduction to Astrophysics course (ASTR 200) will run in the Fall semester, concurrently with Astroimaging Techniques (ASTR 203). We are in the process of making some of the prerequisites corequisites, in order for students to be able to take astrophysics and astroimaging concurrently with their advanced physics courses.

2. Student Learning and Program Data

A. Discuss Student Learning Outcomes Assessment

1. Reflect on recent SLO assessment results for courses offered by the program. 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.

2. Comment on the success rates in the program SLOs that are aligned with specific course SLOs. What do the program SLO and course data reveal about students completing the program? Identify trends and discuss areas in need of improvement. Is the alignment between course and program SLOs appropriate and informative? See **course-to-program SLO alignment mapping**.

The students taking ASTR 203 had done photometry on different types of binary stars and exoplanets and spectroscopy on BE and carbon stars. In doing so, they had to use and control the observatory telescopes, which are a mixture of refractors and Schmidt-Cassegrain telescopes, as well as the SGS spectrograph and the SA 100 diffraction grating spectroscope. They also had to understand the following image processing and spectroscopy programs: CCDSoft, CCDStack, Maxim DL, RSpec and VSpec.

These students had shown, by their reports and by my observing their progress, that they definitely mastered the necessary techniques. Do to their great success, I see no need for improvement. The alignment between course and program SLOs is definitely appropriate.

3. Evaluate the program SLOs in relation to survey data from the degree and certificate award earners survey. What does the survey data reveal about the effectiveness of the program SLOs? Identify trends and discuss areas in need of improvement.

Since our AOOC certificate program is only in its second semester, we have not had any recipients. However, that will change since three students are scheduled to receive their certificates at the end of this Spring semester.

4. Describe any additional methods used to assess program SLOs and reflect on the results of those assessments.

As of now, there are no additional methods used to assess program SLOs, since our certificate program is only in its second semester. However, there are three students, who will complete ASTR 204 and will be getting their certificates this semester, the Spring of 2015.

5. For any courses in the program that satisfy a GE requirement, which GE SLOs are supported or reinforced by the course SLOs? What do assessment results for the course SLOs reveal about student attainment of the GE SLOs? See **GE SLO Alignment Summary Report** or **All Courses GE SLO Alignment Data**.

All of the courses that satisfy a GE requirement have SLOs that are aligned with the "Effective Communication", "Quantitative Skills", and "Critical Thinking" GE SLOs. Since success rates of students attaining the course SLOs has been high in assessments, we can conclude that these courses are indeed supporting students in attaining these three GE SLOs.

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 and Student Outcomes: Transfer. Basic Skills programs should also refer to **ARCC** data.

Student Success Indicators

Astronomy	Success (%)	Retention (%)	Withdraw(%)
2011-12	72.6	89.1	10.9
2012-13	74.6	89.2	10.8
2013-14	71.6	88.6	11.4

College	Success (%)	Retention (%)	Withdraw (%)
2011-12	71	84.7	15.3
2012-13	70.1	83.9	16.1
2013-14	70.2	84.1	15.9

Math/Science	Success (%)	Retention (%)	Withdraw (%))
2011-12	67.4	82.7	17.3
2012-13	66.6	81.1	18.9
2013-14	65.5	80.8	19.2

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 2011-14. In addition, the withdrawal rate is far lower than both college and the Math/Science division.

The following are the Successful Course Completion Rates for the 2013-2014 year.

The success rate for Hispanic students taking Astronomy courses was 55.9%, while it was 55.2% for the Math/Science Division and and 62.9% for the College. The rate for white students was 76.7%, 69.2% and 74.5% respectively. The success rate for Pacific Islander students taking Astronomy courses was 55%, while it was 49.6% for the Math/Science Division and and 60.6% for the College. Black students accounted for only 2.9% of Astronomy's total enrollment, but had a success rate of 57.6%, compared to 51.7% for Math/Science Division and 61.2% for the college. 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. Overall, students are succeeding at a higher rate taking the courses the Astronomy Department offers, compared to the corresponding rates for the Math/Science Department.

Why is this so? Perhaps, students really enjoy taking these courses and as a result respond favorably. Many of them participate in our community outreach activities and also like to let their instructors know of the latest news in astronomy. This means that these students are really interested and as a result have a good success rate.

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 courses have been successful. The enrollment was 119 students in the Fall 2013 semester. The retention rate is 90.8%, compared to 83.9%, summing over all traditional astronomy courses. The success rates are comparable: 66.4% for the online course compared to 63.2% 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.)

Program Efficiency Indicators

For Astronomy:

LOAD for the 2013-2014 academic year was 886.8. The success rate for the same time period was 71.6%, the retention rate was 88.6% and the withdrawal rate was 11.4%.

For the College:

The LOAD figures for the college as a whole were 504.3, for the same time period. The success rate for the College for the same time period was 70.2%, the retention rate was 84.1% and the withdrawal rate was 15.9%.

For the Math/Science Division:

LOAD for the same time period was 489.5. The success rate for the College for the same time period was 65.5%, the retention rate was 80.8% and the withdrawal rate was 19.2%.

The Astronomy Department's LOAD figures are much higher than both the College's and Math/Science departments, The success figures are higher than both the College's and Math/Science departments and the withdrawal figures are lower than both the College's and Math/Science departments. Overall, the Astronomy Department is doing very well in retaining and enabling students to succeed.

3. 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. Our GOTO CHRONOS maintenance contract has been extended for five more years, however our Evans & Sutherland digital system contract has expired April 1, 2014. However, we will be updating our hybrid planetarium system by the end of Fall 2015, using another vendor, RSA Cosmos.

4. Planning

A. Results of Program Plans and Actions

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

Our FLIR camera is 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.

We are using a new spectroscopy tool for our introductory labs. This tool includes a diffraction grating mated to a camera, with included software. This device is manufactured by RSpec and allows students to view spectra in a fun and exciting way. Students really like this visualization of emission spectra because it enables them to see that every gas has a unique spectrum, due to their unique electron

configuration.

We have yet another spectroscopy tool, the LHires Lite. This spectrograph allows students to view the the sun's spectrum in high resolution. Students are able to view the sodium D lines as well as the mercury triplet lines on the sun's photosphere.

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 over the next three years? Make connections to the **College Mission and Diversity Statements**, **Institutional Priorities, 2013/14-2015/16**, and other **Institutional Program Planning** as appropriate. Address discussion in the Student Learning and Program Data section: SLO assessment results and trends in student success indicators.
[**Note**: Specific plans to be implemented in the next year should be entered in C of the Planning section.
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 D1 and D2 of the Career Technical Education section.]

The Astronomy Department now has an Astroimaging and Observatory Operation Certificate (AOOC), 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.

In addition, preliminary talks are underway in considering the feasibility of also offering an AS in Astronomy.

1. To guide future faculty and staff development initiatives, describe the professional 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. There are a number of students, for whom English is their second language. Reading Apprenticeship would be a way to see how well these students are really comprehending their book.

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 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 Budget Committee** (IPBC) in long-range planning, identify any major changes in resource needs anticipated during the next three years. Examples: faculty retirements, equipment obsolescence, space allocation.

See the Resource Requests section below to enter itemized resource requests for next year.
Leave sections blank if no major changes are anticipated.

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. At present, there is just one full time faculty member (on overload) and two adjuncts teaching 1065 students in 26 sections for the 2014-2015 academic year.

Equipment and Technology

At the end of the Fall 2015 semester, the Astronomy department will be upgrading the entire GOTO Chronos Hybrid system. We will be upgrading our present Chronos Hybrid D3 SP2HD to the RSA Cosmos Hybrid system. In this system, our present Chronos star projector will be upgraded to the Chronos II star projector. Here are some of the advantages of the Chronos II: LED stars that are 5x brighter, and minimum fan noise, since the LEDs run cooler than the original lamps. We will not have to replace burnt out lamps anymore, which also saves on cost.

The digital video component of the hybrid is a state-of-the-art system from RSA Cosmos. The video projectors will afford us high fulldome resolution 4k x 4k pixels. This increased resolution will give sharper, more realistic images and is more in keeping with our state-of-the-art facility. There will be numerous astronomical datasets, allowing us to probe deeper into galaxies, allowing us to display the most recent astronomical discoveries to our students and general public. The installation of this new RSA hybrid system will be the first on the west coast and the third in the country.

Instructional Materials

These items are necessary for the ASTR 101 and 103 labs.	Cost
Orion SkyGlow Broadband Filter 10@82.99	$829.90
Solar Motion Demonstrator Kit 10@$32.95	$329.50
iOptron Smartphone Eyepiece Adaptor 3@$58.00	$174.00
Sub Total	**$1333.40**
Estimated shipping and handling and tax	**$ 140.00**
Total	**$1473.40**

Classified Staff

We are now in the process of hiring a new astronomy technician, since our present one, Dean Drumheller, is retiring.

The new planetarium system will lend itself to production of in-house astronomical content. It might be a good idea to have a student from the Digital Media department be hired to produce this content.

Facilities

At the end of the Fall 2015 semester, the Astronomy department will be upgrading the entire GOTO Chronos Hybrid system. We will be upgrading our present Chronos Hybrid D3 SP2HD to the RSA Cosmos Hybrid system. In this system, our present Chronos star projector will be upgraded to the Chronos II star projector. Here are some of the advantages of the Chronos II: LED stars that are 5x brighter, and minimum fan noise, since the LEDs run cooler than the original lamps. We will not have to replace burnt out lamps anymore, which also saves on cost.

The digital video component of the hybrid is a state-of-the-art system from RSA Cosmos. The video projectors will afford us high fulldome resolution 4k x 4k pixels. This increased resolution will give sharper, more realistic images and is more in keeping with our state-of-the-art facility. There will be numerous astronomical datasets, allowing us to probe deeper into galaxies, allowing us to display the most recent astronomical discoveries to our students and general public. The installation of this new RSA hybrid system will be the first on the west coast and the third in the country.

C. Program 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, 2013/14-2015/16**. For each plan, list actions and measurable outcomes. (Plans may extend beyond a single year.)

Plan 1 - Increase Student Success

Description
The Astronomy department would like to have more tutors in the Learning Center. We presently have one tutor but several more would be beneficial for the students.

Action 1	Completion Date	Measurable Outcome(s)
Have more tutors in the Learning Center.	Ongoing	Increased student success in our classes.

Plan 2 - Promote Academic Excellence

Description
Another full-time faculty member should be hired. The department has one full-time faculty member and two adjuncts and the present faculty member is on overload. In addition, a student from the Digital Media department could be hired to produce in-house astronomical content.

Action 1	Completion Date	Measurable Outcome(s)
Hire another full-time faculty member.	Fall/2016	Hiring another full-time faculty member would enable us to add more innovative classes.

Action 2	Completion Date	Measurable Outcome(s)
Hire a student from Digital Media to produce in-house astronomical content.	Summer/2016	Hiring a student to produce in-house astronomical content would expand the offerings our planetarium could offer to students.

5. Resource Requests

Itemized Resource Requests

List the resources needed for ongoing program operation.

Faculty

NOTE: To make a faculty position request, complete **Full-time Faculty Position Request Form** and notify your Dean. This request is separate from the program review.

Full-time faculty requests	Number of positions
Full-time Astronomy faculty position	one

Equipment and Technology

Description	Cost
CCDWare Product Suite - 2@ $841.45	$ 1,682.90
Maxim DL pro suite software - 2@$599	$ 1,198.00
Universal Subscription Software Bisque	$ 1,200.00
2x Black Box 4-Port USB CAT5 Extender Kit #IC400A - 2@$359.95	$ 720.00
Losmandy GM8 mount with Gemini #GM8 GLT	$ 2295.00
Shelyak Calibration Module for Alpy 600	$ 1019.00
Shelyak Guiding Module for Alpy 600	$ 1199.00
ZWO ASI120S Super Speed Monochrome CMOS Camera USB 3.0	$ 399.00
Updated computers, with i7 processors and dual monitors to control observatory telescopes - 4@$2000	$ 8000.00 -
Sub Total	**$17712.90**

Estimated shipping and handling and tax	**$1800.00**
Total	**$19512.90**

Instructional Material

Cos

Description	Cost
Orion SkyGlow Broadband Filter – 10@$82.99	$ 829.90
Solar Motion Demonstrator Kit - 10@$32.95	$ 329.50
iOptron Universal Smartphone Adaptor - 3@$58.00	$ 174.00
Sub Total	**$1333.40**
Estimated shipping and handling and tax	**$ 140.00**
Total	**$1473.40**

Classified Staff

Description	Cost
Not applicable	

Facilities

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

Description	Cost
Not applicable	

6. Program Maintenance

A. 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 100	Darryl Stanford	December 2015
ASTR 101	Darryl Stanford	December 2015
ASTR 103	Darryl Stanford	December 2015
ASTR 115	Darryl Stanford	December 2015
ASTR 125	Darryl Stanford	December 2015

B. Website Review

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

Faculty contact(s) (our Astronomy tech maintains our website)	Date of next review/update
Dean Drumheller	ongoing

C. SLO Assessment Contacts

Faculty contact(s)	Date of next review/update
Darryl Stanford	December 2015
