INSTRUCTION PROGRAM REVIEW: SPRING 2013 SUBMISSION CYCLE

Program Name: Physics
Faculty Contact: David Locke

Academic Year: 2012-2013
Program Review Submission Date: 10 Apr 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 Physics department at CSM offers 4 sequences for students. Which sequence a student will take depends on their educational goal and, in the case of students planning to transfer to a 4-year institution, the institution they plan to transfer to. All four sequences support transfer to a 4 year institution, as well as associate degree requirements. Thus, aligning with the Board of Trustees' Core Value of a Student-Centered Mission, as well as College of San Mateo's Mission Statement.

Physics 100 is a one-sequence course which satisfies the GE requirement of a Physical Science for transfer or Associate's degree.

The Physics 210-220 sequence is designed for students majoring in some field of letters and science. It is required for students planning to enter Medicine, Dentistry, Pharmacy, Optometry, Agriculture, or Forestry.

The Physics 210-211-220-221 sequence is required by some transfer institutions (mainly UC's) for students majoring in fields listed above.

Physics 250-260-270 constitute a three-semester program designed to give students majoring in Engineering, Physics or Chemistry a thorough foundation in the fundamentals of physics.

The department also offers a preparation course, Physics 150, which is designed to get underprepared students ready for the Physics 210-220 and 250-260-270 sequences.

In addition, a three-course sequence, Phys 126-127-128 (cross-listed as BIOL 126-127-128) was added for students interested in careers in science education. These one-unit courses were developed as part of the Aurora project, which in turn is part of the CalTeach project. Each class is limited to a maximum of six students, due to funding for the stipends that students receive. Currently, one physics faculty member and one biology faculty member each get one unit of load for all three courses. These courses are, but probably should not be given the special nature and history of the courses, included in the LOAD calculations for the physics department. They typically carry LOADs well below 100.

Beginning in Fall 2012, the department offered an Honors Seminar in coordination with the other programs in the Math/Science Division. This is in support of the 5 in 5 College Strategies.

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.

Course level SLO assessment has been useful to the department in identifying what areas students are struggling with in the courses and areas where faculty need to work on time-management in the course. At the course level, many actions have involved further review of topics students struggle with. Since most of our assessments are done by using problems on the course final exam, many topics from the beginning of the course may be forgotten by the end. Review of these throughout the

course and at the end of the course has led to improvement. Early on in the department's assessment of SLOs, lack of faculty time management sometimes led to an outcome not being attained by students at all. This has been improved by having faculty more aware of the SLOs for the courses they teach. Some inconclusive results have resulted from the fact that some problems have multiple valid approaches. Students sometimes can correctly solve a problem intended to assess an SLO without demonstrating the outcome. These latter two issues could be remedied by the department drafting common final questions, perhaps three or four per SLO. Faculty could then select which question they would put on their final for SLO assessment. The knowledge of these common questions would help ensure that faculty managed time appropriately.

Program SLO assessment for the AS/AS-T Degree SLOs has just begun with the Student Self-Assessment Survey. Analysis of those results will appear in the 2014 Program Review.

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 and retention in Physics are lower than the college average and are comparable to those in Math. The three years of data provided show an increase in both success and retention from AY0910 to AY1112, but is too little data to indicate a trend.

   Percent enrollments in Physics show greater enrollment in Physics by Asian and Filipino students than for the college as a whole. All other groups are underrepresented in Physics courses compared to the college as a whole.

   Students identifying as Black, Native American and Pacific Islander have 7 or less enrollments per year in Physics. Not much can be said about retention and success for these students, since the enrollment numbers are so small. These three groups do have the lowest in success rates in Math and since every Physics course has a Math prerequisite, students in these groups may not be eligible to enroll in Physics courses. The Physics department may want to together with the division devise strategies to help bring up enrollments by students in these groups.

   The four groups with 30 or more enrollments per year (excluding "other" and "unrecorded") show cumulative success rates of about 60% for Asian, Filipino, and White and about 50% for Hispanic. This 10% gap is fairly large; however, in AY1112 success by Hispanic students was 62.8% statistically the same as the overall 63.4% success rate by all students in Physics.

   Success and retention seem to be higher for students 19 and under than students 20-29. This may be due to external factors for working students and students with families.

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

   The Physics Department has not yet offered any courses through distance education.

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.).

Fall enrollments have increased from Fall 2009 to Fall 2011 at a rate of about 5% per year, partly due to the addition of an evening Physics 210 course to the Fall semester. Spring enrollments have had a slight decrease during the same academic years.

LOAD cannot be compared year-to-year in any easy way. The college's accounting for HBA/TBA hours was done differently in different years effecting WSCH generated by HBA/TBA hours by as much as 30%.

Fall 2009-Fall 2010 FTEF was all generated by Full-Time faculty. This was due to elimination of some sections for budgetary reasons. Beginning in Spring 2011, Professor Locke became the SLO Coordinator at the college. This allowed for some assignments to be given to the department's two adjunct instructors. For Spring 2011-Spring 2012, Full-time FTEF was 80-90% of the total FTEF. In December 2012, Professor Uchida retired after 22.5 years of service in the district. Effective Spring 2013, Professor Uchida became an adjunct instructor. With this retirement, Full-time FTEF will drop to 1.6 and be only 41% of the total FTEF (excluding Full-time overload). Professor Janatpour has planned to retire at the end of the 2013-14 or 2014-15 academic year. Beginning in Fall 2014, Professor Locke will no longer be the SLO Coordinator, but may be the only Full-time faculty member. If Full-time FTEF drops to only 1.00 in Fall 2014, just 25.4% of courses will be taught by full-time faculty.

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
*All courses have been updated with the past 6 years.		
Physics 270	David Locke	Sept 2013
		Tab to add rows

E. Website Review

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

Faculty contact(s)	Date of next review/update
David Locke	31 July 2013
	Tab to add rows

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.

   Not Applicable

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

   Not Applicable.

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.

The Physics department has been doing ongoing assessment of the Course SLOs. Every Course SLO has been assessed multiple times in a three-year period. The department may choose to decrease this frequency to once every two years or once every three years, but no change yet has been implemented.

The assessment process has included using problems on final exams for assessment of SLOs. The department has discussed, but has not yet implemented having common SLO assessing problems on final exams. To allow for some instructor choice, the department has discussed the possibility of crafting a set of three problems for assessing a particular Course SLO, then allowing instructors to choose which of the three they will assess with a common rubric.

B. Program SLO Assessment

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

The department is using the Degree SLO Student Self-Assessment Questionnaire to assess the AS/AS-T Physics Degree SLOs. This assessment tool has been in place for the Summer and Fall 2012 semesters. With only 7 AS Physics degree completers during 5 consecutive academic years (AY06/07-AY10/11), the department is no anticipating having enough data to draw conclusions until after several years of data collection. There may be an increase in degree completers now that the AS-T is an option. Most students completing the major courses transfer to a 4-year institution without receiving an AS degree. The AS-T degree may be more attainable for students during their goal of transfer.

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.

Physics 250, 260 and 270 are required for the AS and AS-T Physics Degrees. As a result, Course SLOs from Physics 250, 260, and 270 are aligned with the degree program SLOs for the AS and AS-T Physics degrees. The alignment is shown in the tracdat report "Course SLOs aligned to Program SLOs."

Physics 100, 210, 220, 250, 260, and 270 fulfill a GE requirement. As a result, Course SLOs from Physics 100, 210, 220, 250, 260, and 270 are aligned with institutional (GE) SLOs. Although these courses support all of the GE SLOs in some way, the Course SLOs are aligned to the Effective Communication, the Quantitative Skills, and the Critical Thinking SLOs. Students receive feedback on laboratory reports, homework assignments, quizzes and exams regarding the clarity of their exposition or presentation of a solution to a problem (Effective Communication). Obviously, successful completion of these courses will require students to solve challenging quantitative problems (Quantitative Skills). Solving problems in physics requires a student to think critically about what physical principles can be applied to solving the problem (Critical Thinking). They must ask themselves (and answer) questions like – "Is mechanical energy conserved in this situation?", "Do I have enough information to answer this using Newton's Laws of Motion?", or "Does this problem involve reflection, refraction, and/or interference of light waves?"

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.

One external factor effecting student success and retention is the lack of computerized prerequisite checking in the physical science and engineering major's sequence (Physics 250-260-270) and in the first semester of the biological science major's sequence (Physics 210). In 2007, the full-time physics faculty from Canada, CSM, and Skyline met to discuss prerequisites for all physics classes. Although, Canada and CSM came to agreement on prerequisites, the faculty from Skyline asked to consult with the Dean of Science/Mathematics/Technology at Skyline and then follow-up. More than 5 years later, Skyline has neither changed their course numbers nor changed the prerequisites of these courses to agree with what Canada and CSM agreed upon.

V. Institutional Planning

A. Results of Plans and Actions

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

Adding a third section of Physics 210 as an evening course in the fall has increased enrollments in Physics 220 in the spring the past two years.

An evening section of Physics 250 was not added to the Fall 2012 schedule, but will be to the Fall 2013. This may help increase Spring enrollments in Physics 260 beginning in 2014.

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 Physics Program at College of San Mateo would like to continue offering quality education to students preparing to transfer to 4-year institutions pursuing bachelor degrees in the sciences and engineering. This aligns with the statement from the College Mission, "***College of San Mateo fosters a culture of excellence and success that engages and challenges students*** *through a comprehensive curriculum of basic skills, career and technical programs, and* ***transfer preparation.***" (Emphasis added.) This also aligns with the Institutional Priorities 2 and 3.

The Program would like to increase retention and success in its classes by making sure students enroll in the correct sequence of courses for their educational goals and complete appropriate prerequisite for the courses they enroll in. This aligns with Institutional Priority 1.

The above will require replacing retiring faculty and expanding supplemental instruction opportunities through tutoring and an instructional aide.

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.

   Bringing new faculty into the department (2 new adjuncts starting in Fall 2013, more full-time and/or adjunct in Fall 2014) will require training in Moodle, Laboratory and Demonstration Equipment, as well as current initiatives (reading apprenticeship) and college procedures.

   With new faculty, specifically what training/development will be needed will depend on the background experience of those individuals.

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.

   Coordination between the Physics Program, the Integrated Science Center and the Learning Center is needed to expand outside of the classroom opportunities for students enrolled in physics classes through peer tutoring or work with a physics instructional aide.

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: Regular full-time faculty FTEF in physics beginning with Spring 2013 is 1.6 or 41% of total physics FTEF. Beginning Fall 2014, regular full-time FTEF may drop to 1.0 or 25% of total physics FTEF. This would have a negative impact on student success. Part-time faculty are not able to be available for office hours at as many times to students. The physics department is in need of hiring one full-time instructor to begin in the Fall 2014. This would still only put regular full-time FTEF at 51% of the total FTEF in physics. The department anticipates needing to hire a second full-time faculty member to begin in the Fall 2015 semester. This would bring regular full-time FTEF up to a healthy 76% of total FTEF after the retirements of Professor Uchida and Professor Janatpour.

Equipment and Technology: Science programs will always have an ongoing need to replace laboratory equipment. The major need now is to replace the 12 student computers used in laboratory experiments. The computers will be 7 years old this summer. Some of the computers have died and the majority may not last another two years. Tablet computers for faculty to use would allow for posting problem solutions that can be “played” with voice audio. The advantage over static solutions is that students can see and hear how the problem is set up and solved.

Instructional Materials: Mathematica is a useful program for creating visuals and animations for use in the classroom. Software licenses for instructor laptops and tablets would be beneficial for student learning. Screen capture software would also be very useful for faculty to have copies of to supplement classroom presentations.

Classified Staff: For increasing student success, the department would like for the college to hire an instructional aide to work in the Learning Center and/or Integrated Science Center as an additional resource for students. Unlike like larger programs like Math and English, Physics only has two full-time instructors. Although these instructors can be available 2 or 3 hours each in the Integrated Science Center, these few hours per week may not serve all students taking physics courses.

Facilities: The Science Building was built at a time when enrollments were low. One restriction on growing enrollments in some courses (program efficiency) is the availability of a lecture room in the Science Building. Physics lectures are not portable to a classroom elsewhere on campus. Demonstration equipment is not easy to transport and demonstrations often require compressed air, gas, vacuum or DC power. These services are not built into the lecture rooms outside of the science building. Long-term, if Physics and other science programs continue to grow, the college may need to build a second science building (or a science building annex) to the east or west of Building 36.

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:

Increase Student Success in Physics

Description

The Physics Department would like to increase student success in physics, particularly in Physics 210 and 250. To do this, the Department would like to (1) hire a 60% Instructional Aide II to be available for tutoring students in the Integrated Science Center and/or Learning Center. (2) Expand peer tutoring in the Learning Center. (3) Purchase Tablet computers to allow instructors to record problem solutions, which can help students develop problem solving skills.

Action(s)	Completion Date	Measurable Outcome(s)
Hire an Instructional Aide II at 60% or higher and expand peer tutoring in the Learning Center	Fall 2013 Choose Year or Semester/Year	Increase in student success in Physics 210 and 250 by 10% by end of Fall 2014.
Purchase 3 Tablet PC's to allow Instructors to record problem solutions	Fall 2013 Choose Year or Semester/Year	Increase in percentage of students that correctly solve problems that are used in the assessment of course level SLOs
Click here to enter action	Choose Year or Semester/Year	Click here to enter measurable outcome

Plan 2

Title:

Maintain Staffing Levels and Promote Academic Excellence

Description

To continue to offer a high quality education to science and engineering students transferring to 4-year institutions, the Physics Department needs to replace retiring faculty. One member of the Physics faculty retired effective Jan 2013. A second faculty member plans to retire in August of 2014. Replacing retiring faculty will also allow members of the Physics Department to serve on various institutional committees, thus Enhancing Institutional Dialog (Institutional Priority 5).

Action(s)	Completion Date	Measurable Outcome(s)
Hire a full-time faculty member to start Fall 2014.	Fall 2014	Success and retention rates in physics will not drastically drop. (Hiring only one faculty

		member will have us low on staffing levels, so a measurable outcome is a little hard to define. I expect that student retention and success will drastically drop if retiring full-time faculty members are not replaced.)
Hire a full-time faculty member to start Fall 2015.	2015	Success and retention rates in physics will not drop.
Click here to enter action	Choose Year or Semester/Year	Click here to enter measurable outcome

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
Physics to begin 2014-15	1
Physics to begin 2015-16	1

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
12 Student PC Laptops with Bluetooth (for data collection in the laboratory)	$19,000

5 Spectrometer and Goniometer units at $3998.00 each + tax and shipping	$23,000

Description (for prioritized plans)	Plan #(s)	Cost
3 64-bit Tablet PCs with built-in Bluetooth	1	$6000

Instructional Materials

Description (for ongoing program operation)	Cost
Mathematica 9 License with Premier Service (2)	$270

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

Classified Staff

Description (for ongoing program operation)	Cost

Description (for prioritized plans)	Plan #(s)	Cost
Instructional Aide (60%) $27,500 + estimated benefits	1	$37,000
Peer Tutoring (additional 6 hrs per week, 43 weeks per year)	1	$2,580

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	Increase Student Success in Physics	$45,580
2	Maintain Staffing Levels and Promote Academic Excellence	
	For additional plans, add rows and number accordingly.	