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Instructional Program Review

Program Name: **Physics**

Program Contact: **Locke, David**

Academic Year: **2013-2014**

Status: **Submitted**

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, 2008-2013, 5 in 5 College Strategies, Spring 2011**, and other **Institutional Program Planning** 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.

2. Student Learning and Program Data

A. Discuss Student Learning Outcomes Assessment

Reflect on recent SLO assessment results for courses and degrees and certificates offered by the program. Identify trends and discuss areas in need of improvement.

Physics offers two degree options which require the same Physics courses (250-260-270), an AS and an AS-T. Five students completed the online degree application and the Self-Assessment survey between Summer 2012 and Spring 2013. Five students is also the number

reported to have either received degrees in Summer or Fall 2012 or been candidates in Spring 2013. All five students agreed or strongly agreed with the three Likert scale questions they were asked:

Based on my experiences at CSM, I can...

1. Apply the Laws of Physics to real-world problems
2. Collect and Analyze data to verify physical principles
3. Undertake upper division Physics coursework at a 4-year college

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. Finding time to develop these questions has been difficult due to lack of full-time faculty in the department. Currently regular full-time faculty accounts for less than 40% of the total FTEF in the department. The physics department hopes to develop these questions in the coming academic year and assess course level SLOs using them in Spring 2015, Fall 2015, and Spring 2016. But, completing an assessment cycle on this schedule will require hiring full-time faculty members to replace retirees.

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 a high point in both success and retention for 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 8 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 work 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. Unfortunately, there was a 6.4% overall drop in success from AY1112 to AY1213. THOUGH, overall success in AY1213 is still higher than AY1011, indicating that AY1112 may be the outlier. This drop is most notable in the Filipino group, where the drop was from 70% to 30.6%, and in the Hispanic group, where the drop was from 62.8% to 43.4%. For both of these groups, success in AY1213 is lower than in AY1011.

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 courses as distance education. The department will begin offering distance education courses during the 2014-15 academic year.

- 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.)

Enrollments have increased from AY1011 to AY1213 at a rate of about 5% per year, partly due to the expansion of evening course offerings.

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%. LOAD in physics is limited by the size of some of the course offerings, most notably the Cal-TEACH courses (126-127-128) and the Honors Seminar (329). Due to enrollment limits in these courses. The combined LOAD in 126-127-128 in the current semester is 38.

LOAD is reduced in Physics by assignments in the Integrated Science Center and in Fall 2012 was reduced by assignments in the Math Resource Center. In Fall 2012, the denominator for calculating LOAD in Physics included FTEF which was assigned to the Math Resource Center. Removing assignments to labs and centers from Fall 2012 results in a LOAD of 460.1, much above the provided 396.6.

Due to the nature of the course offerings in Physics and assignments in the Learning Support Centers, LOAD is not expected to reach 500 for the Physics Department. Physics would like to expand its offerings of double lab sections, which can carry much higher LOADs than single lab sections. This is possible to some extent and the program has seen recent growth. However, there is a large constraint on double section offerings due to the lack of lecture rooms in Building 36. Also, the department will need to replace retired or retiring faculty to have healthy growth and increase LOAD.

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, Regular Full-time FTEF dropped to 1.6 and was only 36.6% of the total FTEF (39% was Adjunct FTEF and 24.3% was Overload FTEF). Professor Janatpour plans to retire at the end of the 2014-15 academic year. Beginning in Fall 2015, Professor Locke will be the only Full-time faculty member unless the college hires replacements for the retired faculty. If Full-time FTEF drops to only 1.00 in Fall 2015 and offerings remain unchanged, just **24.4% of course FTEF will be taught by full-time faculty**.

3. Career Technical Education

- D. 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.

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

4. 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 6 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.

This problem not only lowers success and retention rates, but also LOAD. Students who have not met the prerequisites for the course enroll and are not dropped by the system before the semester starts. If these students drop (or are dropped from) the course after the start of the semester, the census enrollment in the classes will be lower. These students will displace eligible students who will look to other colleges to enroll in the course. Thus further impacting the department's LOAD.

5. Planning

A. Results of Program 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 2011 and 2012 semesters has increased enrollments in Physics 220 in the spring semesters.

An evening section of Physics 250 is now offered and the enrollments for Physics 260 and 270 have increased, with a double section of Physics 260 offered this semester.

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, 2008-2013**, 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 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 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 (4 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 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

Regular full-time faculty FTEF in physics beginning with Spring 2013 was 1.6 or 39% of total physics FTEF. Beginning Fall 2015, regular full-time FTEF will drop to 1.0 or 24.4% 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 two full-time instructors to begin in the Fall 2015. Hiring only one would only put regular full-time FTEF at 48.8% of the total FTEF in physics. Two hires are needed in Fall 2015 to bring regular full-time FTEF up to a healthy 73.2%, which is just a little short of the optimal 75%, 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 college has budgeted to replace the 12 student computers used in laboratory experiments this year. 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. The department plans to begin using Net Support Classroom with new student tablet computers. If the new student use computers are Windows 8 machines, the department will need to upgrade software for use in data collection.

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 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. 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, 2008-2013**. For each plan, list actions and measurable outcomes. (Plans may extend beyond a single year.)

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 2014	Increase in student success in Physics 210 and 250 by 10% by end of Fall 2015.
Purchase 3 Tablet PC's to allow Instructors to record problem solutions	Fall 2014	Increase in percentage of students that correctly solve problems that are used in the assessment of course level SLOs

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 two full-time faculty members to start Fall 2015.	Fall 2015	Success and retention rates in physics will not drastically drop.

6. 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, AY 2013-2014** and email to your Dean. This request is separate from the program review.

Full-time faculty requests	Number of positions
Physics Faculty	2

Equipment and Technology

Description	Cost
5 Spectrometer and Goniometer units at \$3998.00 each + tax and shipping	\$23,000
3 64-bit Tablet PCs with built-in Bluetooth	\$6000
4 Ohaus Cent-o-gram balances	\$1120.62

Instructional Material

Description	Cost
Mathematica 9 License with Premier Service (2)	\$270
Net Support School Classroom Management Software + Annual Maintenance Plan (20 licenses) + Tax?	\$501.57
Pasco Capstone Site License	\$649

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
Physics 126	David Locke	October
Physics 127	David Locke	October
Physics 128	David Locke	October
Physics 220	David Locke	October
Physics 270	David Locke	October

B. Website Review

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

Faculty contact(s)	Date of next review/update
David Locke	15 June 2014

C. SLO Assessment Contacts

Faculty contact(s)	Date of next review/update

