Basic Program Information

Department Name:

Physics / Engineering / Nanotechnology

Division Name:

PSME

Program Mission(s):

Physics - Provide undergraduate education founded on a rigorous, applied treatment of physics fundamentals coupled with experiential exercises and a broad commitment to generate and disseminate knowledge.

Engineering - Provide undergraduate education founded on a rigorous, applied treatment of engineering fundamentals coupled with modern engineering tools.

NANO - Develop materials engineering skills in workforce and incumbent worker training, and prepare transfer students for advanced courses in materials science and engineering

Please list all Program Review team members who participated in this Program Review:

Name	Department	Position
David Marasco	Physics	Instructor
Sarah Parikh	Physics/Engineering	Instructor
Sue Wang	Physics/Engineering	Instructor
Frank Cascarano	Physics	Instructor
Robert Cormia	Chemistry	Instructor

Physics

Total number of Full Time Faculty:	*There are 2 FT faculty in Physics, in addition 2 more split time between Physics and Engineering*
Total number of Part Time Faculty:	7

Engineering

Total number of Full Time Faculty:	*See Physics*
Total number of Part Time Faculty:	3

Nanotechnology

Total number of Full Time Faculty:	*1*
Total number of Part Time Faculty:	0

Please list all existing Classified positions:
An Instructional Lab Coordinator is shared between Physics and Engineering. She also is responsible to the needs of the PSME division at large.

List all Programs* covered by this review & check the appropriate column for program type:

Program Name	Certificate of Achievement Program	Associate Degree Program	Pathway Program
Physics		X	
Engineering	**X**	X	
Nanotechnology	**X**	X	

*If you have a supporting program or pathway in your area for which you will be making resource requests, please analyze it within this program review (i.e. Integrated Reading and Writing, Math My Way, etc.) You will only need to address those data elements that apply.

Section 1: Data and Trend Analysis

a. Program Data:

Data will be posted on http://foothill.edu/staff/irs/programplans/programreviewdata.php for all measures except non-transcriptable completion. You must manually copy data in the boxes below for every degree or certificate of achievement covered by this program review.

Transcriptable Programs	2010-2011	2011-2012	2012-2013	% Change
AS Degrees - Physics	3	4	**1**	**-75%**
AS Degrees – Engineering	2	5		

Please provide any non-transcriptable completion data you have available. Institutional Research does not track this data; you are responsible for tracking this data.

Non-Transcriptable Program	2010-2011	2011-2012	2012-2013	% Change
Nano	0	0	**0**	

b. Department Level Data:

Physics:

	2010-2011	2011-2012	2012-2013	% Change
Enrollment	1,305	1,252	1,309	4.6
Productivity (College Goal 2013-14: 535)	592	461	423	-8.3
Success	76%	69%	71%	3
Full-time FTEF	1.7	2.1	2.7	28
Part-time FTEF	4.8	4.2	4.4	-6.1

Engineering:

	2010-2011	2011-2012	2012-2013	% Change
Enrollment	167	168	184	9.5
Productivity (College Goal 2013-14: 535)	359	335	303	-9.5
Success	75%	80%	83%	3.5%
Full-time FTEF	.4	1.0	.9	-12.7%
Part-time FTEF	.7	.4	.8	100%

Nanotechnology:

	2010-2011	2011-2012	2012-2013	% Change
Enrollment	47	65	38	-26
Productivity (College Goal 2013-14: 535)	243	268	170	-37
Success	37	44	33	-25
Full-time FTEF	0	0.4	0.4	0
Part-time FTEF	0.4	0	0	0

c. Associate Degree Transfer (ADT)

There is a fall 2014 legislated deadline for approval of ADTs (AA-T/AS/T degrees). **If there Is a Transfer Model Curriculum (TMC) available in your program, you are *required* to offer an approved AA-T/AS-T.** Indicate the status of your program's ADT:

Physics

Check one	Associate Degree Transfer Status
	State Approved
X	**Submitted to CCCC**
	Submitted to Office of Instruction
	In Progress with Articulation
	Planning Stage with Department
	Not Applicable

If you are required to offer an approved ADT and it has not been state-approved, please comment on the program's progress/anticipated approval date.

Physics has submitted our ADT to the state and are awaiting word from them.

Engineering

Check one	Associate Degree Transfer Status
	State Approved
	Submitted to CCCC
	Submitted to Office of Instruction
	In Progress with Articulation
	Planning Stage with Department

X	**Not Applicable**

If you are required to offer an approved ADT and it has not been state-approved, please comment on the program's progress/anticipated approval date.

Engineering as a field is exempt from SB1440.

Nanotechnology

Check one	Associate Degree Transfer Status
	State Approved
	Submitted to CCCC
	Submitted to Office of Instruction
	In Progress with Articulation
	Planning Stage with Department
X	**Not Applicable**

If you are required to offer an approved ADT and it has not been state-approved, please comment on the program's progress/anticipated approval date.

Nanotechnology will not have an ADT (we are the only approved program in the State)

Using the prompts and the data from the tables above, provide a short, concise narrative analysis for each of the following indicators. If additional data is cited (beyond program review data sheet), please indicate your data source(s).

d. Enrollment trends: Over the last three years, is the enrollment in your program holding steady, or is there a noticeable increase or decline? Please comment on the data and analyze the trends.

In Physics, enrollment has been fairly steady over the past three years. A drop in WSCH was seen due to the elimination of TBA hours, but we saw slight growth last year. In Engineering, enrollment has been increasing. We are offering new courses and additional sections, so our productivity has decreased slightly. We expect newly attracted students to take multiple courses here at Foothill – benefitting our department and others. In Nanotechnology, There was a slight increase in enrollment in 11-12 but an overall decrease in enrollment in 12-13. Some advanced classes stayed steady (NANO53), some increased (NANO52) and others decreased (NANO51) the addition of a summer session did help, but for only one year.

e. Student Demographics: Please comment on the enrollment data, comparing the program-level data with the college-level data. Discuss any noticeable differences in areas such as ethnicity, gender, age and highest degree.

In Physics, the most glaring difference comes in the category of gender, where our student population is 30% women, comparing unfavorably with the campus-wide percentage of 54%. However, this should be seen in the proper context. Only 32% of the students in the highest-level AP courses are women (http://scitation.aip.org/content/aapt/journal/tpt/50/2/10.1119/1.3677282) and women account for just 19% of all physics bachelor degrees in the United States (http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1294&context=advance). Our problems with the gender divide in physics are part of a larger problem in society.

Physics sees a 50% Asian population compared to 26% college wide, this may be due to a combination of our strong international presence, and cultural attitudes surrounding Asian-Americans and science. We see roughly half as many African-Americans and Latino/as as the college as a whole. We should make a concerted effort to better understand why this is, although we suspect that once again we are seeing a reflection of society at large.

In Physics the age cohort skews younger than the college as a whole, as we are mainly a transfer department.

In Engineering, we see 14% female students. We have implemented instructional changes to help better support and encourage our female students. While it may take time to see these effects, we are also planning on expanding our support training. Race and age breakdowns are similar to the Physics department.

NANO: White 44%, Asian 29%, Latino 8%, is fairly consistent from class to class. Gender is ~ 80:20 male female, not atypical for engineering, with higher percentage of woman in younger age groups, also a typical trend. This is in contrast with College demographics, and more consistent with industry/academia, where women comprise ~ 20% of professional positions. Age groups are dominated by 40 and older at 44%, with equal amounts in 20-24 and 25 to 39 (25% each) and very few 19 and younger. This reflects attractiveness of nanotechnology to incumbent workers, and nanoscience only recent for traditional students. Success in the program would be 50% or more in 25 to 39, representing the prime age for workforce development.

f. **Productivity**: Although the college productivity goal is 535, there are many factors that affect productivity, i.e. seat count/facilities/accreditation restrictions. Please evaluate and discuss the productivity trends in *your program*, relative to the college goal and any additional factors that impact productivity. If your productivity is experiencing a declining trend, please address strategies that your program could adopt to increase productivity.

Productivity in Physics has dropped to 423. This is in-part due to the way that the lab sections dictate enrollment management. Our seat count for labs is 28. This means that for most courses we will offer double sections, featuring a lecture of up to 56 students and a pair of 28-student labs. When we have a lecture with 40 students, this means that we'll have a pair of labs that average 20 students, which has a big effect on productivity. In the past we've been careful about not letting these courses run, but in the past few years we have been advised to optimize for WSCH rather than productivity. Note that in the near future that we may need to take a productivity hit as we try to grow the Physics 5 series. There was a time when the full-time faculty could expect to teach one double-lab lecture and one single each quarter, the expectation is now two-double lab lectures, so when the college chooses to optimize for productivity and does not let small classes go, we should be in a position to rapidly increase productivity. We are also hampered by the fact that we don't have any large online classes that we could use as "catch-up" for lower-enrollment courses. However, the department could look into offering hybrid classes. There is willingness to explore this option on a trial basis. When and if the department offer large enrollment GE courses, productivity should also increase, however, this possibly will only be at the cost of other science GE departments.

In Engineering, productivity has been steady –although slightly declining due to opening additional sections and courses that will make expansion easy. The mainstream transfer courses have productivities between 300 and 400. The not-mainstream transfer courses have productivities between 50 and 220. First-time course offerings are expected to have much higher productivities in the second and third offering as the word gets out about the courses.

NANO - Productivity in nanoscience has always been low, something that we are acutely aware of. Outreach to high schools might be a positive impact in enrollment, which is planned for fall quarter 2014 (Palo Alto High School) and winter quarter 2015 (Gunn High School). Adding a hybrid/online section for incumbent workers (fall 2014) will help bring in students looking for 'fast-track' knowledge and skills.

Section 2: Student Equity and Institutional Standards

As part of an accreditation requirement, the college has established institution-set standards across specific indicators that are annual targets to be met and exceeded. Please comment on how these indicators compare at your program level and at the college level. (For a complete description of the institutional standard, please see the instructional cover sheet)

a. Institutional Standard for Course Completion Rate: 55%

Please comment on your program's course success data, including any differences in completion rates by student demographics as well as efforts to address these differences.

Physics has a success rate of 71%, this is due to fact that we are a transfer program rather than basic skills. For our Physics 2 sequence students must have completed Math 48C, and for Physics 4, Math 1A. Our rates are slightly better than the math courses at the same skill/preparation level.

Engineering has a success rate of 83%, this is due in part to the nature of the introductory courses and in part due to the outstanding math and physics preparation that our students have before taking many of our courses.

It should be noted that the success rate of targeted ethnic groups is 62%, ten points below the 72% of non-targeted groups. College-wide these two numbers are 68% contrasted with 80%, so correcting for an overall lower success rate, our achievement gaps is consistent with the college as a whole. This is also true for Engineering with 70% and 85%.

NANO: Over two-thirds of students succeed in these classes, however there is a fairly large disparity between older and younger students, with older (college degree) students succeeding at 80%. Women do slightly better than men, including younger students, but numbers are small. Similarly, Latinos do not succeed as well as other populations (lesser science /workforce foundation). African Americans are virtually absent from the program (n=1 currently)

b. Institutional Standard for Retention: 50%

Please comment on the course retention data for your program, including any differences in retention rates by student demographics as well as efforts to address these differences, should they exist.

This box intentionally left blank.

c. Institutional Standard for Degree Completion Number: 450

Has the number of students completing degrees in your program held steady or increased/declined in the last three years? Please comment on the data, analyze the trends, including any differences in completion rates by student demographics.

In Physics we deal with very small sample sizes, at the level we are looking at, noise dominates the data. Physics serves to train engineers, very few students actually go on to collect a degree in physics. In Engineering, the number of units needed for a degree precludes most students from earning a degree before transfer. As the number of units required to earn a BS in Engineering is large, most of our students who go on to earn the degree do not have the time to complete Foothill's requirements for a degree, and hence our numbers do not reflect our true success. Additionally, transfer schools do not need or want the students to complete GE requirements before transferring into engineering.

d. Institutional Standard for Certificate Completion Number (Transcriptable): 325
Has the number of students completing certificates in your program held steady, or increased/declines in the last three years? Please comment on the data, analyze the trends, including any differences in completion rates by student demographics.

Physics and Engineering do not currently offer certificates. Certificate programs are in process for Engineering.
NANO offers three certificates and an AS degree. Students are not familiar with the process of requesting certificates, however roughly a dozen students are eligible to receive certificates of proficiency, and ~ 10 in achievement, and ~ 2 AS degrees.

e. Institutional Standard for Transfer to four-year colleges/universities: 775
Based on the transfer data provided, what role does your program play in the overall transfer rates? Please comment on any notable trends or data elements related to your program's role in transfer. Nanoscience is not defined as a CTE program (yet) but does receive Perkins funding (now) for microscopy training. As determined through student evaluations and projects, the majority (60%) of students in this program is employed, and especially in advanced courses, apply knowledge and skills to their immediate job and career goals. New course offerings specifically target the employability of an incumbent and transitional workforce.

Physics and Engineering do not graduate many degree holders, however, most of the students who complete our programs do go on to transfer. Anecdotally, nearly 100% of the Physics 4D students go to four-year colleges in the fall. Similarly, nearly 100% of Engr 45 and 37 students transfer in the fall as well. While I don't have official data, I get many messages back from students lauding the preparation that they received at Foothill as compared to the preparation level of the students from other schools in their classes.

NANO - Students in this program are largely not transfer students, instead focusing on workforce development and personal enrichment. We are seeing a larger number of students completing one or more nanoscience courses and transferring to four year colleges. Currently we have two students completing AS degree/transfer in NANO.

Section 3: Core Mission and Support

The College's Core Missions are reflected below. Please respond to each mission using the prompts below.

a. Basic Skills: (English, ESLL and Math): For more information about the Core Mission of Basic Skills, see the Basic Skills Workgroup website: http://foothill.edu/president/basicskills.php

If your program is categorized as a basic skills program, please discuss current outcomes or initiatives related to this core mission and analyze student success through the core mission pathway.

If your program is NOT categorized primarily as a basic skills program, comment about how your program/classes supports Foothill's basic skills mission and students.

None of these related programs are basic skills, and outside of serving as a goal for successful basic skills students, it is unclear how we support this population.

b. Transfer: For more information about the Core Mission of Transfer, see the Transfer Workgroup website: http://foothill.edu/president/transfer.php
If your program is classified as a transfer program, please discuss current outcomes or initiatives related to this core mission and analyze student success through the core mission pathway.

Again, due to the requirements involved in obtaining a local degree, most of our students elect for a straight transfer and are therefore hard for us to track in our official statistics. Anecdotally, we send most of our students to four-years.

NANO - A number of students have transferred to four-year colleges and universities after taking one or more courses in the program, but this is not common. One younger student has completed the program and will be transferring to UCSC (likely) in 4 more quarters, and two other students will be completing an AS degree and/or transferring.

If your program is NOT categorized primarily as a transfer program, please comment about how your program/classes support Foothill's transfer mission and students.

c. Workforce: For more information about the Core Mission of Workforce, see the Workforce Workgroup website: http://www.foothill.edu/president/workforce.php
If your program is classified as a workforce program, please discuss current outcomes or initiatives related to this core mission and analyze student success through the core mission pathway.

Nanoscience is a CTE program receives Perkins funding (now) for microscopy training. As determined through student evaluations and projects, the majority (60%) of students in this program are employed, and especially in advanced courses, apply knowledge and skills to their immediate job and career goals. New course offerings specifically target the employability of an incumbent and transitional workforce.

If your program is NOT categorized as a workforce program, please comment about how your program/classes support Foothill's workforce mission and students.

Physics supports many Allied Health programs via the Physics 2 series, as well as kinesiology (we recently modified our order of presentation of content in order to help with kinesiology's transfer degree).

Section 4: Learning Outcomes Assessment Summary

a. Attach 2012-2013 Course-Level – Four Column Report for CL-SLO Assessment from TracDat, please contact the Office of Instruction to assist you with this step if needed.

b. Attach 2012-2013 Program Level – Four Column Report for PL-SLO Assessment from TracDat, please contact the Office of Instruction to assist you with this step if needed.

Section 5: SLO Assessment and Reflection

Based on your assessment data and reflections, please respond to the following prompts.

a. **What curricular, pedagogical or other changes have you made as a result of your CL-SLO assessments?**

Many members of the physics faculty further embrace the tenets of peer instruction when they discuss their reflections of the SLO assessments, and this has inspired some changes in instruction, especially a push to non-synchronous instruction. In engineering SLO reflections have helped to inform curricular refinements. NANO: The most significant change was the full integration of the PNPC integrated engineering model for materials engineering in all three advanced courses, and a proposed course (NANO62) that integrates the key elements of three advanced courses into one course, targeted for workforce (incumbent training). An additional new pedagogy (APNANO) may be developed for NANO10 taught in high schools built on common core standards.

b. **How do the objectives and outcomes in your courses relate to the program-level**

In the process of mastering the skills needed for the individual classes in the physics sequences, the students learn how to approach problems in a logical manner and how to discuss and present said problems and solutions. This also applies to design and analysis of experiments. This serves our students well for both transfer and career preparation. NANO: Students integrate fundamental science concepts and principles with engineering applications, especially related to materials solutions to large societal problems. This prepares students for effective careers, meet employer needs, and contribute to society. The pedagogical approaches and goals also support a STEM

student learning outcomes and to the college mission?

c. How has assessment of program-level student learning outcomes led to certificate/degree program improvements? Have you made any changes to your program based on the findings?

In Physics and Engineering, no structural changes have come about from program-level SLO reflections. We are constrained by C-ID and other transfer/articulation agreements. In NANO A consistent observation and challenge is that students with college degrees and concurrent technology related employment sail through these courses, while students with only a year of chemistry and/or little physics will struggle with the material, especially advanced assignments. Nanoscience is an advanced subject that is more easily taught to advanced students. The challenge remains to develop a sound foundational course in nanoscience built on the high school common core standards.

d. If your program has other outcomes assessments at the program level, comment on the findings.

None for physics/engineering.
In Nano, two areas of improvement include the addition of laboratories where students can do real work, such as the microscopy lab (AFM/SEM) and materials characterization laboratory at NASA-ASL. Informal internships have helped the more motivated students reinforce learning outcomes in the context of experimental work, including R&D relevant to curriculum. A second change was to 'pause' on integrating a new conceptual approach to explaining emergence of material properties that did not prove effective.

e. What do faculty in your program do to ensure that meaningful dialogue takes place in both shaping and evaluating/assessing your program's student learning outcomes?

The physics/engineering faculty hold meetings weekly where pedagogy and other departmental matters are discussed. We are a small, cohesive group that works well together. That being said, the department would benefit from a retreat where we could spend time away, discussing pedagogy and other topics.

In addition, we would like to purchase a modern ScanTron reader that would allow us to import multiple-choice data directly to spreadsheets for deeper analysis. As is, we cannot do strong data mining on our SLO assessments in a reasonable amount of time.

Faculty speak openly with students about how concepts are understood, what topics and ideas make sense and what ones do not, and how to help students master material. Faculty also speak with each other about how students are picking up material, and additionally how students with different science foundations and materials experience are learning, or struggling, with topics. In the advanced courses, materials processing and characterization, we have to continually try different approaches to determine if students are proficient at memorization or have a real engineering understanding.

Section 6: Program Goals and Rationale

Program goals address broad issues and concerns that incorporate some sort of measurable action and connect to Foothill's core missions, Educational & Strategic Master Plan (ESMP), the division plan, and SLOs. Goals are not resource requests.

List Previous Program Goals from last academic year: check the appropriate status box & provide explanation in the comment box.

Goal/Outcome (This is NOT a resource request)	Completed? (Y/N)	In Progress? (Y/N)	Comment on Status
1. Introduction of Physics 5 Sequence.	No	Yes	The Physics 5 sequences saw another mis-start this Fall, when the first class could not make enrollment. We will attempt a re-launch this Winter.
2. Updating and Broadening Existing Engineering Courses	Class Dependent	Yes	Work on Eng 6 is substantially complete, Eng 49 is in process. Engineering is working on sequences on Biomedical Devices and 3D Printing. In addition, with the CSU schools allowing for digital electronics and dynamics at the lower-division level, we are writing COR for those classes.
3. Improving technology use in peer-instruction classes	No	Yes	The department has introduced tablets with cameras and recording software. They post summaries of in-class discussions on YouTube. These videos are well-watched by the students, and based upon the short time we've been doing it, seem to have supported student success. In-class discussion topics have

			also been posted online. More time and effort should be spent on these experiments.
4. Lab Support	No	Yes	This should properly be viewed as an ongoing goal that should not have a termination date. Each year the faculty strive to improve or replace the two bottom labs in our inventory, improving the experience for our students.
5. Develop a sustainable cohort model in nanoscience	No	Yes	This remains a challenge for the program, we have focused on workforce training, and have continued the series for a half dozen students.

New Goals: Goals can be multi-year (in Section 7 you will detail resources needed)

Goal/Outcome (This is NOT a resource request)	**Timeline (long/short-term)**	**How will this goal improve student success or respond to other key college initiatives?**	**How will progress toward this goal be measured?**
6. Learn new pedagogy directed at retention of women students (and retention in general).	Long and short	This goes directly to student success equity.	Comparison long-term trends in female enrollment in physics and engineering.
7. Community building for Engineering/Physics Students.	Long and short	Studies have shown that a sense of community is a key factor in student retention.	Long-term trends in enrollment and retention.
8 Workforce track for NANO	Intermediate/long	Developing a compressed course for workforce (NANO62)	Enrollment in that course, and training in small (lab) workshops.

Section 7: Program Resources and Support

Using the tables below, summarize your program's unfunded resource requests. Refer to the Operations Planning Committee website: http://foothill.edu/president/operations.php for current guiding principles, rubrics and resource allocation information.

Full Time Faculty and/or Staff Positions

Position	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Was position previously approved in last 3 years? (y/n)
Neither Physics nor Engineering request a new faculty member. **This being said, given recent growth in engineering, should the number of full-time faculty drop below four due to unforeseen circumstances, physics/engineering would be stretched thin, and a replacement hire would be needed.** **NANO requests no additional faculty but does note that the one full-time faculty often teaches energy and time is split in that area.**			

Unbudgeted Reassigned Time (calculate by % reassign time x salary/benefits of FT)

Has the program received college funding for reassign time in the last three years? (y/n)	If yes, indicate percent of time.
Has the program used division or department B-budget to fund reassign time? (y/n)	

Indicate duties covered by requested reassign time:

Responsibility	Estimated $	Related Goal from Table in section 6 and how this resource request supports this goal.	Est hours per month	% Time

One Time B Budget Augmentation

Description	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Previously funded in last 3 years? (y/n)
Bring in an expert on recruitment and retention of women in Physical Sciences/Engineering	$3000	#6. Various institutions have implemented programs and shifts in pedagogy that have improved enrollment by women in our targeted classes, we would like to have appropriate training.	No.
Funds for piloting community building and activities/events.	$4000	#7. Response to STEM scholarship opportunities revealed that many in the engineering cohort feel separate from Foothill STEM as a whole. We wish to hold community-building events that would change this outlook and improve retention/enrollment.	No.
Purchase of USB ScanTron for SLO Data-mining	$950	This is a goal from our SLO reflections, it goes to helping us do better assessment, which should better shape our analysis of our in-class strengths and weaknesses in the content.	No.
Funds for marketing outreach in NANO, and emphasis on better messaging to current student population (database marketing)	$1000	Increase sustainability of cohorts and overall participation by workforce	No.

Ongoing B Budget Augmentation

Description	$ Amount	Related Goal from Table in section 6 and how this resource request supports this goal.	Previously funded in last 3 years? (y/n)

Facilities and Equipment

Facilities/Equipment Description	$ Amount	Related Goal from Table in section 6 and how this resource request	Previously funded in last 3 years? (y/n)

		supports this goal.	
Purchase/maintenance of equipment for physics labs.	$30k	#4. Financial support of science teaching laboratories needs to be ongoing. We strive to improve our "bottom two" labs each year. At fifteen stations per lab, and an estimated $1000 per station, this comes to $30k.	Yes
Purchase equipment for expansion of engineering offerings and continuing development of existing engineering classes.	$250k	#2 & #4	Yes
Complete build-out of microscopy lab with cabinets and lab tools, and perhaps an optical microscope	$5K	#6 increase awareness of capabilities of Foothill in microscopy and analysis	No

Section 8: Program Review Summary

Address the concerns or recommendations that were made in prior program review cycles, including any feedback from Dean/VP, Program Review Committee, etc.

Recommendation	**Comments**
1. Rates of student success.	We continue to attempt the launch of Physics 5. We have had discussions with counseling, gone into the appropriate math classes, and talked to our own students about this sequence. It is our firm belief that once in place, some structural problems will be addressed. In addition, individual instructors have placed content on the internet for 24/7 viewing, which will hopefully aid students. Many full-timers also hold office hours or workshops at the PSME center.
Effective use of instructional technology and professional development in that area	Physics and engineering have had extensive discussions about the desired practices around newer instructional technologies and policies have been drafted.
Identification of PT faculty to develop Engineering courses	Two sequences in Engineering have been developed by PT faculty
Eng 37 and 37L are old.	These COR have been updated.

Develop a sustainable cohort model for NANO	Work with partnering groups/channels, especially workforce/incumbent worker training

a. After reviewing the data, what would you like to highlight about your program?

Physics & Engineering:
Based upon the anecdotal evidence given by people who return from four-year institutions, students who complete our sequences are well-prepared for transfer. This is supported by scores on industry-standard exams we use for SLO assessment.

The Physics 2AM/BM/CM sequence has been introduced, and this solved a long-standing problem we had with UC transfer.

The Physics Show is approaching an attendance of 10k a year, which makes it one of the largest outreach efforts by Foothill College. We are now performing outreach into Title I schools, busing in children who may otherwise lack exposure to science instruction, or for that matter a vision of college in their futures. The STEM Summer Camp very successful in introducing women and underrepresented groups to Foothill and STEM, and we plan to expand.

The department is at the forefront of the movement to flip classes, utilizing technology to make more class time for peer instruction.

Faculty have many other projects such as the STEM Newsletter, the Science & Engineering Association, the Physics Olympics, the Physics Olympiad, the PRIP Scholarship and other community-building activities that keep us engaged outside of the classroom. They are also active in Foothill's shared governance and local professional assocations.

One area of concern is that our core of part-time faculty has seen attrition, and we need to refill the pool with instructors.

The nanoscience program is a forward looking program in an unfolding and evolving engineering program. After completing a NSF funded program development, we are refocusing on workforce training with a compressed 'program in a course' offering, and using informal internships to keep younger students engaged in real science. The addition of an electron microscope has brought excitement into our program, and the potential to do collaborative projects with the materials engineering group.

Section 9: Feedback and Follow Up

This section is for the Dean to provide feedback.

a. Strengths and successes of the program as evidenced by the data and analysis:

1. The core FT are an exceptional cohesive team who are student focused.
2. They success rate is exceptional for the student skills required to be successful. They also have good course retention. The faculty use new pedagogy and technology to engage the students.
3. Engineering has the potential to double in size, which will create an increased demand for physics & math.
4. The outreach to the community as well as creating a STEM student community at Foothill.

b. Areas of concern, if any:

1. Physics 5 series is not successful after multiple false starts. The faculty did all of the proper steps to promote it.
2. Nano has just started to get a pipeline of workforce students integrated with NASA/ASL.
3. Recruiting new PT faculty in both Physics and Engineering. They will need to train on how FH does labs & lectures for course consistency. They will need a new FT faculty in 2015Fall.

c. Recommendations for improvement:

1. Physics 5 should be retired. Effort should be to enhance Physics 6 as preparation for taking Physics 4A.
2. Nano needs to develop both high school and workforce pathways.
3. Actively recruit new faculty. Review existing faculty to ensure proper level of course content.

d. Recommended next steps:

_X__ Proceed as planned on program review schedule
___ Further review/Out of cycle in-depth review

Upon completion of section 9, the Program Review should be returned to department faculty and staff for review, then submitted to the Office of Instruction and Institutional Research for public posting. See timeline on Program Review Cover Sheet.

Unit Course Assessment Report - Four Column

Foothill College

Department - Physical Sciences & Engineering (PSE)

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Physical Sciences & Engineering (PSE) - PSE 111A - PASS THE TORCH TEAM LEADER TRAINING I - Communication - The student will be able to develop interpersonal and communication skills necessary for effective team leading (Created By Department - Physical Sciences & Engineering (PSE)) **Start Date:** 04/08/2013 **End Date:** 06/28/2013 **Course-Level SLO Status:** Active	**Assessment Method:** Students will write a self-reflection paper that requires students to assess their overall performance as a tutor for the quarter. Students had to comment on their communication, self-esteem, team dynamics, strengths, and struggles. **Assessment Method Type:** Essay/Journal **Target for Success:** 80% will identify areas of improvement which leads to meaningful change	07/26/2013 - The self-reflection papers were well written, well though-out, and insightful. Students seemed very honest with assessing their tutoring experiences throughout the quarter. Many commented on their uneasiness and lack of confidence starting out as a tutor. They valued the discussions of their peers' tutoring experiences in class and said it helped them to better communicate their thoughts and expectations to their tutees. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013 **GE/IL-SLO Reflection:** Students' tutoring experiences improved as well as their interpersonal and communication skills.	07/26/2013 - Continue having students do a final self-reflection paper at the end of the quarter assess their experiences and growth. The leader check-ins where students are required to talk about their weekly tutoring experiences (successes and struggles) with the class was deemed very helpful by many students. Continue to have all students talk and communicate their experiences every week.
Department - Physical Sciences & Engineering (PSE) - PSE 111A - PASS THE TORCH TEAM LEADER TRAINING I - Tutor - The student will be able to employ tutoring techniques which will facilitate member's active participation and learning (Created By Department - Physical Sciences & Engineering (PSE)) **Course-Level SLO Status:** Active	**Assessment Method:** Observe through discussion and role play the student's ability to ask questions which lead tutee to greater understanding of concepts and problem solving techniques. Students are also required to keep a weekly journal of each tutoring experience. **Assessment Method Type:** Discussion/Participation **Target for Success:** 80% of students will be able to ask meaningful questions and or engage their tutee to think on their own.	07/26/2013 - Students seem to value hearing their peers' tutoring experiences because it helps them problem solve and address their own team issues. Students have improved in their communication skills and are always willing to discuss and share problems they face in team meetings. Students have a better sense of the Socratic Method and seem to be employing the tutoring technique more naturally and on a more regular basis. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	07/26/2013 - Continue with regular discussions and role playing in class.
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Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Engineering (PSE) - PSE 111B - PASS THE TORCH TEAM LEADER TRAINING II - Communication - The student will be able to develop advanced interpersonal and communication skills necessary for effective team leading (Created By Department - Physical Sciences & Engineering (PSE)) **Course-Level SLO Status:** Active	**Assessment Method:** Students will write a self-reflection paper that requires students to assess their strengths and areas for improvement as a tutor **Assessment Method Type:** Essay/Journal **Target for Success:** 80% of students will identify areas for improvement which leads to meaningful change	07/26/2013 - Students were very honest and open with their tutoring experiences and growth as a tutor. Many commented on gaining a greater sense of confidence, more ease in trying various tutoring strategies, and improvements in their communication with their tutees. Some also commented on developing more empathy and gaining a better sense of their tutees struggles. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013 **GE/IL-SLO Reflection:** Students have improved in their interpersonal and communication skills and have developed more empathy for their tutees' struggles.	07/26/2013 - Continue with the self-reflection papers! It provides a lot of feedback to both the student and instructor.
Department - Physical Sciences & Engineering (PSE) - PSE 111B - PASS THE TORCH TEAM LEADER TRAINING II - Tutor - The student will be able to employ advanced tutoring techniques which will facilitate member's active participation and learning (Created By Department - Physical Sciences & Engineering (PSE)) **Course-Level SLO Status:** Active	**Assessment Method:** Observe through discussion and role play the student's ability to ask questions which lead tutee to greater understanding of concepts and problem solving techniques. Students are also required to keep a weekly journal of their tutoring sessions. **Assessment Method Type:** Discussion/Participation **Target for Success:** 80% of students will ask meaningful questions	07/26/2013 - 2nd time tutors seem to use the Socratic Method more naturally and on a more regular basis to engage their tutees in learning. They seem very at ease with tutoring and more patient and empathetic toward the tutee. They are good role models for the 1st time leaders. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	07/26/2013 - Continue with role play and discussions. Students seem to enjoy them as well.
Department - Physical Sciences & Engineering (PSE) - PSE 301 - CAREER DEVELOPMENT THROUGH CLASSROOM OBSERVATIONS - Evaluate Novel Approaches to teaching - The student will evaluate novel teaching methods for their effectiveness in enhancing student engagement in the classroom (Created By Department - Physical Sciences &	**Assessment Method:** A survey taken at the end of the quarter which addresses first whether or not novel classroom strategies were recognized, second which strategies seemed most effective, and third whether or not those effective strategies showed potential for positive change in the student's own classroom.	12/14/2012 - This class was not offered during the 2012-2013 academic year. **Result:** Target Not Met **Year This Assessment Occurred:** 2012-2013 **Resource Request:** none	

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Engineering (PSE)) **Assessment Cycles:** End of Academic Year **Start Date:** 06/01/2012 **End Date:** 06/30/2013 **Course-Level SLO Status:** Active	**Assessment Method Type:** Survey **Target for Success:** 100% of students reporting that novel teaching methods were identified and evaluated for success.	**GE/IL-SLO Reflection:** Not applicable- the class was not offered during the 2012-2013 academic year.	
Department - Physical Sciences & Engineering (PSE) - PSE 301 - CAREER DEVELOPMENT THROUGH CLASSROOM OBSERVATIONS - Propose Change - The student will analyze effective teaching strategies to identify those that most promise positive change in his or her own classroom. (Created By Department - Physical Sciences & Engineering (PSE)) **Assessment Cycles:** End of Academic Year **Start Date:** 06/01/2012 **End Date:** 06/30/2013 **Course-Level SLO Status:** Active	**Assessment Method:** A survey taken at the end of the quarter which addresses first whether or not novel classroom strategies were recognized, second which strategies seemed most effective, and third whether or not those effective strategies showed potential for positive change in the student's own classroom. **Assessment Method Type:** Survey **Target for Success:** 95% of students hypothesizing positive change upon implementation of new strategies	12/14/2012 - This class was not offered during the 2012-2013 academic year and so no reflections may be generated. **Result:** Target Not Met **Year This Assessment Occurred:** 2012-2013 **Resource Request:** none **GE/IL-SLO Reflection:** Not Applicable since this class was not offered during 2012-2013.	
Department - Physical Sciences & Engineering (PSE) - PSE 41 - CLASS PRACTICES: MIDDLE SCHOOL SCIENCE - Deciding to become a teacher - Students enrolled in PSE-41 will learn about the basic duties and responsibilities associated with a career in K-12 education, and they will learn about the steps required to earn a teaching credential in the state of CA. (Created By Department - Physical Sciences & Engineering (PSE)) **Start Date:** 09/26/2011 **End Date:** 12/10/2012	**Assessment Method:** Students enrolled in PSE-41 will spend a minimum of 18 hours (2 hours/week for 9 weeks) in a K-12 classroom (middle school math or science) with an assigned mentor teacher. **Assessment Method Type:** Observation/Critique **Target for Success:** Completion of all hours as shown in the classroom log with the mentor teachers signature.	04/08/2013 - We had one student enrolled in PSE-41 in Winter 2013. She completed over 18 hours in a K-12 classroom as evidenced by their signed classroom logs collected at the end of the quarter. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	

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Course-Level SLO Status: Active			
Department - Physical Sciences & Engineering (PSE) - PSE 41 - CLASS PRACTICES: MIDDLE SCHOOL SCIENCE - Current issues in education - Students enrolled in PSE-41 will study, observe and discuss relevant issues in the current K-12 classrooms. (Created By Department - Physical Sciences & Engineering (PSE)) **Start Date:** 09/26/2011 **End Date:** 12/10/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Students enrolled in PSE-41 will be assigned reading from current education journals regarding common issues in the K-12 classroom. Students will participate in weekly group discussions drawing on the reading, classroom observations and additional sources in discussion and debate. **Assessment Method Type:** Discussion/Participation **Target for Success:** Participation in all weekly seminar sessions held on the Foothill campus. Sessions are 1.25 hours long.	04/08/2013 - The one student in PSE 41 in Winter 2013 attended seminars with the students from PSE 42 and 43 covering the following topics: 1)how to earn a teaching credential in CA, 2)learning styles and multiple intelligence, 3)assessment and assignments, and 4)creating a positive class environment. Student also participated in weekly discussions, including discussions about time spent in the K-12 classroom under the guidance of a mentor **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	
Department - Physical Sciences & Engineering (PSE) - PSE 42 - CLASS PRACTICES; ELEMENTARY SCHOOL SCIENCE - Continued exploration of the teaching field - Students enrolled in PSE-42 will expand upon their previous knowledge of the K-12 education system. (Created By Department - Physical Sciences & Engineering (PSE)) **Start Date:** 09/26/2011 **End Date:** 12/10/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Students enrolled in PSE-42 will spend a minimum of 18 hours (2 hours per week for 9 weeks) in a K-12 classroom (elementary school) under the guidance of an experienced mentor teacher. Students will participate in group discussions regarding their work in the K-12 classroom. **Assessment Method Type:** Discussion/Participation **Target for Success:** Successful completion of the 18 hours as evidenced by a signed classroom log, and participation in weekly seminars on the Foothill campus.	04/08/2013 - We had one student enrolled in PSE 42 in Winter 2013. She completed over 18 hours in a K-12 classroom as evidenced by the signed classroom log submitted at the end of the quarter. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	
Department - Physical Sciences & Engineering (PSE) - PSE 42 - CLASS PRACTICES; ELEMENTARY SCHOOL SCIENCE - Current events in K-12 education - Students in PSE 42 will continue to study, observe and discuss current topics relevant	**Assessment Method:** Students in PSE 42 will work under the guidance of a K-12 mentor teacher, observe and assist in a K-12 classroom, and participate in weekly seminar sessions to	04/08/2013 - The one student in PSE 42 during Winter 2013 participated in seminars and discussion sessions with all students from PSE 41 and 43. Topics included: 1)how to become a credentialed teacher in CA, 2)learning styles and	

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to K-12 education. (Created By Department - Physical Sciences & Engineering (PSE)) **Assessment Cycles:** End of Academic Year **Start Date:** 01/09/2012 **End Date:** 06/28/2013 **Course-Level SLO Status:** Active	discuss the current issues in K-12 education. **Assessment Method Type:** Discussion/Participation **Target for Success:** Completion of 18 hours or more in a K-12 classroom (36 total, including PSE 41 hours), and active participation in weekly reading assignments and seminar sessions.	multiple intelligence, 3)creating a positive class environment, and 4)assessment and assignments. Student also shared her experiences from the K-12 classroom under guidance of her mentor teacher. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	
Department - Physical Sciences & Engineering (PSE) - PSE 43 - CLASS PRACTICES: HIGH SCHOOL SCIENCE - Continued exploration of the teaching field - Students enrolled in PSE-43 will expand their knowledge of teaching as a career by working under a new mentor teacher in a new classroom setting. (Created By Department - Physical Sciences & Engineering (PSE)) **Start Date:** 09/26/2011 **End Date:** 12/10/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Students enrolled in PSE-43 will complete a minimum of 18 hours (2 hours/week for 9 weeks) in a K-12 classroom (high school) under the guidance of an experienced mentor teacher. Students will assist and observe in the K-12 classroom, and share/analyze their experiences in weekly group discussions on the Foothill campus. **Assessment Method Type:** Discussion/Participation **Target for Success:** Completion of 18 hours as evidenced by a signed classroom log, and participation in weekly seminar sessions.	04/08/2013 - We had two students in PSE 43 in Winter 2013. Both completed over 18 additional hours in the K-12 classroom setting as evidenced by the signed classroom log turned in at the end of the quarter. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	
Department - Physical Sciences & Engineering (PSE) - PSE 43 - CLASS PRACTICES: HIGH SCHOOL SCIENCE - Compare and contrast teaching careers based on grade level and subject matter - Students enrolled in PSE-43 will be able to compare and contrast teaching careers of various grade levels and subject matters in order to determine their best fit teaching career. (Created By Department - Physical Sciences & Engineering (PSE)) **Assessment Cycles:** End of Academic Year	**Assessment Method:** Students in PSE-43 will have served for a minimum of 54 total hours (18 hours in PSE-43) in at least three different K-12 settings of various grade levels and subject matters. This experience will help PSE-43 students to determine the best grade level and subject matter for a credential program and future career. **Assessment Method Type:** Discussion/Participation **Target for Success:** Survey of PSE-43 students (either via discussion or polling) to determine next	04/08/2013 - Both students from Winter 2013 were surveyed at the end of the quarter. One student from Winter 2013 is applying to SJSU for the single subject credential program in biology starting fall 2013. The other student continues to work on her BA degree, and she is considering a career in educational support such as tutoring rather than a career as a full-time teacher in a classroom. **Result:** Target Met **Year This Assessment Occurred:** 2012-2013	

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Start Date: 01/09/2012 **End Date:** 06/28/2013 **Course-Level SLO Status:** Active	steps for entering a credential program for K-12 teaching.		