Annual Instructional Program Review Template for 2011-2012

Introduction to The Program Review Process for Instructional Programs

Program Review at Foothill College

Purpose

An effective program review supports continuous quality improvement to enhance student learning outcomes and, ultimately, increase student achievement rates. Program review aims to be a sustainable process that reviews, discusses, and analyzes current practices. The purpose is to encourage program reflection, and to ensure that program planning is related to goals at the institutional and course levels.

Process

Foothill College academic programs that lead to an A.A./A.S. or Certificate(s), or are part of a specialized pathway, such as ESL, Developmental English, Math My Way are reviewed annually using this template, with an in-depth review occurring on a three-year cycle. The specialized pathways may be included as part of the program review for the department, or may be done as a separate document if they are not part of a department that offers a degree or certificate. Faculty and staff in contributing departments will participate in the process. Deans provide feedback upon completion of the template and will forward the program review on to the next stage of the process, including prioritization at the Vice Presidential level, and at OPC and PaRC.

Annual review will address five core areas, and include a place for comments for the faculty and the dean or director.

1. Data and trend analysis
2. Outcomes assessment
3. Program goals and rationale
4. Program resources and support
5. Program strengths/opportunities for improvement
6. Administrator's comments/reflection/next steps

Foothill College Program Review Cycle:

2011-2012 All academic programs participate in an annual program review

2012-2013 1/3 of academic programs participate in comprehensive review, remaining 2/3 of programs update their annual program review

Contact: Office of Instruction and Institutional Research, 650-949-7240

Instructions: Complete this template with data on any degree, certificate, or pathway your department offers. Return the completed form to your Dean on the last day of Fall quarter.

Website: http://foothill.edu/staff/irs/programplans/index.php

2011-2012 Submission Deadline:

All program review documents are due to Deans by December 16

Basic Program Information

Department Name: Physics/Engineering/Nanotechnology

Program Mission(s): Provide undergraduate education founded on a rigorous, applied treatment of physics' fundamentals coupled with experiential experiences and a broad commitment to generate and disseminate knowledge. (Physics)

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

Program review team:

Name	Department	Position
Sue Wang	Physics & Engineering	Instructor
Frank Cascarano	Physics	Instructor
David Marasco	Physics	Instructor
Sarah Parikh	Physics & Engineering	Instructor
Robert Cormia	Chemistry	Instructor
Jenny Liang	PSME	Lab Coordinator

Programs* covered by this review

Program Name	Program Type (A.S., C.A., Pathway, etc.)	Units**
Physics	A.S.	90
Engineering	A.S.	90
Nanotechnology	A.S.	90

*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. For example, ESLL, Math My Way, etc. You will only need to address those data elements that apply.

****Certificates of 27 or more units must be state approved**. If you have certificates that are 27 or more units that are not state approved, please indicate your progress on gaining state approval, with the tentative timeline for approval, or your plan for phasing out the certificate.

Section 1. Data and Trend Analysis

1.1. Program Data will be posted on: http://foothill.edu/staff/irs/programplans/programreviewdata.php for all measures except non-transcriptable completion. Please attach all applicable data sheets to the final Program Review document submitted to your Dean. You may use the boxes below to manually copy data if desired.

Transcriptable Program	2008-2009	2009-2010	2010-2011	% Change
Physics AS	3	1	3	**200%**
Engineering AS	4	4	1	**-50%**

Please provide any non-transcriptable completion data you have available.

Non-Transcriptable Program	2008-2009	2009-2010	2010-2011	% Change
N/A				

1.2 Department Data

Physics

Dimension	2008-2009	2009-2010	2010-2011	% Change
Enrollment	1032	1166	1232	6%
Productivity (Goal: 546)	511	534	568	7%
Success	71%	73%	76%	4%
Full-time FTEF	2.8	2.7	1.7	-37%
Part-time FTEF	2.9	3.8	4.9	29%
Full-time Staff	1	1	1	0%
Part-time Staff	0	0	0	0%

Engineering

Dimension	2008-2009	2009-2010	2010-2011	% Change
Enrollment	116	193	202	5%
Productivity (Goal: 546)	278	363	319	-12%
Success	73%	71%	75%	6%
Full-time FTEF	0.0	0.3	0.4	33%
Part-time FTEF	0.8	0.5	0.8	59%
Full-time Staff	0	0	0	0%
Part-time Staff	0	0	0	0%

Nanotechnology

Dimension	2008-2009	2009-2010	2010-2011	% Change
Enrollment	9		47	
Productivity (Goal: 546)	135		267	
Success	44%		79%	
Full-time FTEF	0.1	0.0	0.0	
Part-time FTEF	?	?	0.4	

Full-time Staff	0	0	0	
Part-time Staff	0	0	0	

Department Course Data

Physics

	2008-2009			**2009-2010**			**2010-2011**		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success	Enroll.	Prod.	Success
2A	180	648	66%	208	610	76%	279	663	79%
2B	37	389	92%	86	552	93%	120	535	84%
2C	32	488	94%	55	529	95%	52	706	96%
4A	244	564	58%	273	534	53%	321	569	65%
4B	180	442	60%	205	439	69%	172	455	76%
4C	129	377	91%	148	598	89%	132	494	87%
4D	57	547	91%	43	584	81%	36	506	86%
6	77	245	78%	60	277	80%	19		63%
12	75	1124	71%	64	960	69%	90	1350	68%
34H	18	134	94%	13	195	92%	4	60	75%
36	1	inf	100%	7	inf	86%	4	Inf	100%

Engineering

	2008-2009			**2009-2010**			**2010-2011**		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success	Enroll.	Prod.	Success
10/20	38	266	65%	65	404	63%	48	292	68%
35	13	195	85%	27	405	59%	25	375	68%
36/36X	1	Inf	100	2	inf	100%			
37	37	505	68%	29	435	68%	39	411	67%
37L	10	191	100%	18	270	89%	19	285	95%
45							13	252	100%
49	17	126	82%	40	199	78%	30	150	83%
600				14	211	79%	26	390	73%

Nanotechnology

	2008-2009			**2009-2010**			**2010-2011**		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success	Enroll.	Prod.	Success
NANO 50							14	293	
NANO 51	9	135					18	270	
NANO 52							15	225	
NANO 53									

1.3 Using the data and prompts, provide a short narrative analysis of the following indicators.

1. 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.

   Physics has seen steady growth in enrollment over the period in question. Engineering has also seen growth, and we expect to see large gains due to the new hire (we now have a full-time instructor in a program mainly supported by part-timers). Both programs expect a large increase with the opening of the PSEC. Growth in engineering will also translate into growth in physics.

   Enrollment for nanotechnology courses has remained at around a dozen students per class when one section only was offered, and remains at about 15 students concurrently enrolled (completing) in the two courses simultaneously offered in the program. These numbers vary from quarter to quarter. Most students who enroll in the program find these courses by navigating through the course schedule. We do not have an effective outreach into high schools, and have struggled with developing a cohort model through workforce development (NOVA). Over half of students now enter the courses out of sequence, meaning they start advanced courses first, as they did not know about introductory courses. It is too early to tell if there is a pattern of enrollment for these courses. Academic year 2009-2010 was a 'rebuild' year for the nanotechnology program, with the creation of NANO50 (Nanoscience) as an 'on ramp' to the program, using funding from the NSF-ATE grant (0903316). We began the nano series in fall 2010 (NANO51) followed by NANO50 (Nanotechnology Applications) in winter 2011. Both NANO51 (Nanotechnology Applications) and NANO52 (Nanostructures and Nanomaterials) have been offered in previous years, but never in a sequence as we are doing now. We have a cohort of about a dozen students entering NANO50/51 with about eight that will complete all four courses in the sequence in winter 2012. At the same time we are beginning a core sequence of students in NANO50/51 in fall 2011 and winter 2012, however these students may be more interested in a 'survey course' than an actual program. We also have students entering the program in advanced courses; NANO52 (Nanostructures and Nanomaterials), NANO53 (Nanomaterials Characterization) and NANO54 (Nanofabrication). From our final exit survey in NANO53 Nanocharacterization (fall 2011) we expect about 8 students to enter NANO54 Nanofabrication (winter 2012).

2. Completion Rates (Has the number of degrees/certificates held steady, or increased or declined in the last three years? Please comment on the data and analyze the trends.
   a. AA, AS, transcriptable certificates
      i. The number of AS degrees awarded by the physics and engineering departments has been in the single digits over the years in question. This reflects the fact that our students have transfer in mind rather than completion of degrees. Better data will become available with the introduction of the transfer degree.

ii. Nanotechnology has not completed a cohort of students yet (first group winter 2012). We will have seven to eight students completing the entire five course sequence next quarter.

b. Local, non-State approved certificates
c. Certificates less than 27 units: All certificates less than 27 units should be reviewed carefully to determine if the certificate provides a tangible occupational benefit to the student, such as a job or promotion or higher salary, and documentation should be attached.

3. Productivity: The college productivity goal is 546. (Please analyze the productivity trends in your program and explain factors that affect your productivity, i.e. GE students, size restrictions)

   a. **The Physics and Engineering programs have seen growing productivity. Lab size limits productivity, however the size of lab classes will be increased with the move to PSEC, and more double-lab lectures will be offered.**
   b. **The Nanotechnology is significantly below 546 (perhaps half that). With enrollment gains to 15 to 20 per class productivity could move closer to 400. Productivity savings come from grant funded activities, and potentially CTE funding for Nanoscience training.**

4. Course Offerings (Comment on the frequency, variety, demand, pre-requisites.) Review the enrollment trends by course. Are there particular courses that are not getting the enrollment or are regularly cancelled due to low enrollment?)

   a. **In physics, the 2 sequence has seen strong enrollment. Physics 4D has seen declining enrollment. The drop in 4D enrollment was expected as we changed articulation agreements with some UC schools, this may change with CC-ID. Physics 4D has also not been offered the past two summer sessions. Physics 6 has also seen declining enrollment. One reason for this is that we now allow Physics 2A to act as a pre-requisite for 4A if the student does not have a high school physics background, whereas only Physics 6 could do this in the past. With the introduction of the Physics 5 sequence, which does not require high school physics as a pre-requisite, Physics 6 may be redundant.**
   b. **In engineering, while enrollment changes considerably from year to year, the trend has been for increasing enrollment. With the addition of a new full-time faculty member for the 2011-2012 year, additional course offerings, and an increase in resources (specifically LEGO robot kits for Engineering 10) we expect the trend of increasing enrollment to continue.**
   c. **In Nanotechnology, all four courses tend to enroll at 10 to 12 students. They are offered to complete our contractual commitment to the National Science Foundation for this project (NSF-ATE award 0903316). Typically NANO50 is offered in fall, NANO51 in winter, NANO52 in spring, NANO53 in fall, and NANO54 in winter. NANO53/54 may additionally be offered in summer immediately following NANO52 in spring.**

5. Curriculum and SLOs
    a. Comment on the currency of your curriculum, i.e. are all CORs reviewed for Title 5 compliance at least every three years and do all prerequisites, co-requisites and advisories undergo content review at that time? If not, what is your action plan for bringing your curriculum into compliance?

The curriculum is current. All SLOs are complete.

    b. Comment on program mapping and how it ties to the college Mission(s).

The physics and engineering program offerings are designed to build a community of scholars who are able to think critically and communicate through equations and through verbal explanations. In physics and engineering, computation - being able to use equations – is a focus so that students will be prepared in situations that may arise in the future. In engineering, there is a large focus on the local and global community as products are designed to help people in the world around us. The physics and engineering programs are geared towards enabling transfer students with the skills and knowledge needed to succeed in their future classes and careers.

The Nanotechnology program current focus is on workforce development, especially advanced manufacturing, and nanomaterials engineering of clean energy technology, a key emphasis in Silicon Valley and Science and Learning Institute (SLI). The transfer pathway to SJSU and UCSC are in progress.

    c. Identify any other programs with which your program has overlap, and comment on the purpose of the overlap.

Physics, engineering and Nanotechnology are a natural pairings, sharing a good deal of content, viewed from different angles. Both require the full six quarters of transfer-level math. In order to produce well-rounded scientists, chemistry and physics students are required to take classes in the opposite department. The physics 2 sequence supports allied health.

    d. Comment on any recent developments in your discipline which might require modification of existing curriculum and/or the development of new curriculum?

Physics education as a field has pushed very strongly into peer interaction. Our department believes in this progressive, student-centered pedagogy. This is one of the reasons we are developing the Physics 5 sequence.

Engineering education research has expanded greatly recently and focused on design projects for first-year students and hands-on experiences in graphics classes. The engineering field is also changing in terms of the globalization of design projects. The

Introduction to Engineering course should be modified to reflect these changes. The plan is to develop a series of engineering courses that cover sustainability and energy.

Technology evolution in nanomaterials engineering requires constant effort, as advances in nanoscience, developments in process engineering tools, and advances in application space, including clean energy technology, biomedical devices, and advanced materials (thin films, nanocarbon materials, etc.)

e. Do all of the courses in your program have SLOs identified? Do all programs have program-level student learning outcomes? If not, what is your plan for completing these?

All physics courses have SLOs, and all recently-offered Engineering courses have SLOs. The programs have PLOs. Assessment of PLOs is scheduled for Spring 2012.

All Nano courses have SLOs, and PLOs were also developed as part of the NSF-ATE sponsored program 0903316 and have been reported to NSF in annual reports. SLO assessments have been done for all SLOs in NANO50 and NANO53. Cormia has not taught NANO51 recently; those SLOs will be assessed in winter quarter 2011. As NANO54 (Nanofabrication) is taught for the first time in winter 2012, we will assess the SLOs in place.

There are PLOs for the program that we are also evaluating as NANO50 (Nanoscience) and NANO53 (Nanocharacterization) complete this fall. We are asking students to share their integrative knowledge (See NSF PLOs). In NANO53 we have seen enough evidence (assignments from advanced students) to see integrative learning. The key PLO for integrative learning is the PNPA rubric process => structure => properties, and using characterization to inform process development and optimization, and elucidation of structure property relationships.

6. Basic skills Programs (Please describe your Program's connection to this core mission, if applicable):

   NOT APPLICABLE

7. Transfer Programs: Articulation (Please describe your Program's connection to this core mission, if applicable)

The Physics 2 and 4 series map directly onto CSU, UC and private colleges.
All Engineering courses less than #50 articulate to UC, CSU and many private colleges.

The NANO courses are in the process of articulation to the UC & CSU. Since the subject is multidisciplinary it is difficult to get a one-one mapping.

8. CTE Programs: Labor/Industry Alignment (Please describe your Program's connection to this core mission, if applicable)

NOT APPLICABLE TO PHYSICS AND ENGINEERING

Nanotechnology is strongly aligned with CTE. Students can enter Foothill College with a science and engineering foundation and complete a program in nanoscience and nanotechnology in 4-5 quarters. There is strong CTE potential for retraining if we have a source of cohorts such as a NOVA (workforce). A large number of dislocated engineers have interests in learning nanoscience concepts to help prepare them for reentering the workforce (two students in NANO53 are training specifically to gain skills in characterization of clean energy materials). Incumbent training is equally strong (two students in NANO53 are currently employed in biomaterials/biomedical devices). Additionally, one student in NANO53 is applying for a position as a NASA-ASL intern (nanocarbon research) and one student completing just one class (NANO50) will likely be offered a position as a NASA Educational Research Associates intern in developing advanced biofuels. Both of these intern applicants are degree holders (BS Chemistry and BSc Physics) and each holds graduate training (entrepreneurship) and/or an advanced degree (computer graphics).

Section 2. Learning Outcomes Assessment Summary

2.1. Attach 2010-2011 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.

2.2 Attach 2010-2011 Course-Level – Four Column Report for CL-SLO Assessment from TracDat

Section 2 Continued: SLO Assessment and Reflection

2.3 Please provide observations and reflection below.

2.3.a Course-Level SLO

What findings can be gathered from the Course Level Assessments?

Successful students show gains at or above national levels in PHYS 4A and 4B, however, many students do not successfully complete these two classes. The department is satisfied with the performance of the students in 4C and 4D.

The engineering department is undergoing rejuvenation and is taking a clean-sheet approach. Previous course-level SLOs were deemed insufficient for the path forwards.

For the Nano courses there is a marked difference in performance between degree holding students (BA/BS in technology related field) and students who are just beginning their foundational science education. Degree holders are able to grasp nanoscience concepts faster and more completely. Additionally, students who are employed in the workforce now in technology related fields have little difficulty with the scenario based learning, as their direct knowledge and experience aids assimilation of new and/or derivative material. For students with experience the curriculum could be more complex, bit for students without experience the curriculum and vocabulary can be very challenging to master.

What curricular changes or review do the data suggest in order for students to be more successful in completing the program?

In physics we will be implementing the 5ABC sequence to complement the 4AB classes. 5ABC will slow down the pace of information and allow much more peer interaction. We will also use much more instructional technology, developing a partnership with the Kahn Academy for our students who need targeted math support, and the use of tablets or laptops in peer-interaction settings. The physics labs will also be reinvigorated with the move to PSEC.

The Engineering courses have languished for a number of years. Much of the lab equipment was sent to De Anza in late 90s. The Engr 6, Graphics has not been offered in the last 10 years and will be offered in 12fall. Engr 45, Materials has not had the lab equipment and students have to go to SJSU for lab, but will in PSEC. The Nano and Engineering 45 course will share the same lab space in PSEC as the subject matter overlaps. A new series of engineering courses are being developed based on sustainability and energy. At least one of the courses will be submitted as GE to attract a broad student base.

How well do the CL-SLOs reflect the knowledge, skills, and abilities students need in order to succeed in this program?

The course-level SLOs have provided valuable feedback to the faculty, and hit the core of what students need to learn in physics.

How has assessment of course-level student learning outcomes led to improvement in student learning in the program?

Faculty are in the process of developing 5ABC and the math review program in cooperation with the Kahn Academy, and have made constant improvements in our labs.

The Engineering 10 Course, Intro to Engineering has become directed towards the end-to-end process. The type of subjects and examples are tied to current real world events and concerns. The “product” development as part of the portfolio is based on using the Lego Kits that permit students to develop intricate systems without issues of parts incompatibility.

In the Nano courses a clear-cut difference in student success on assignments based on their foundational preparation (science and technology) has caused me to rethink how assessment is done. There is a tendency among weaker/younger students to attempt to ‘copy and paste’ their way through research/writing assignments, and it is difficult to see what learning has occurred. Experienced students can blend ‘top of head’ knowledge with new concepts and clearly show enhanced abilities. This was especially evident in NANO53, where students described how they would immediately apply knowledge of materials characterization in the workplace => incumbent training.

2.3.b Program-Level SLO

What summative findings can be gathered from the Program Level Assessments?

PLOs will be assessed Spring 2012.

How has assessment of program-level student learning outcomes led to certificate/degree program improvements?

PLOs will be assessed Spring 2012.

2.4 Annual Action Plan and Summary: Using the information above, list the program's action steps, the related [Core Mission objective](), SLO assessment data and the expected impact on student success.

Action Step	**Related SLO assessment (Note applicable data)**	**Related ESMP Core Mission Goals (Basic Skills, Transfer, Work Force, Stewardship of Resources)**	**How will this action improve student learning/success?**
1 Physics 5ABC	Success in 4A/4B	Transfer	Stretching 4AB from two quarters to three will aid in retention.
2 Kahn Academy		Transfer	Assuring that students have targeted assistance in math is beneficial, we can spend our time teaching physics, not math.
3 Lab improvements	Physics, Engineering and Nano Lab SLOs that speak to Improvements in experiments/equipment.	Transfer & work force	Properly equipped labs are needed.
4 Peer-Interaction Tech	Success in Phys 4A/4B	Transfer	This will address a problem with peer-instruction, lack of a record that students can access. This will strengthen our peer-instruction model.
5. Complete development of all nanoscience / nanotech curriculum	Complete one full cycle of PL/SLO assessment	Enhances completeness of skills for workforce effectiveness	More integrated program
6. Add hands-on laboratory (TBA) activities for all courses	Increase hands-on activities with engineering, nanoscience,	Enhances practical learning and workforce effectiveness	Demonstration of core concepts, hands on use of instruments, hands on experience in

	nanomaterials characterization and processing tools.		nanomaterials and engineering
7. Develop internships	Relates to projects	Real world learning for workplace competency	Real world experience

Section 3: Program Goals and Rationale

Program goals should be broad issues and concerns that incorporate some sort of measurable action and should connect to Foothill's core missions, Educational & Strategic Master Plan (ESMP), the division plan, and SLOs.

3.1 Program relation to college mission/core missions

The department commits itself to providing access to outstanding educational opportunities for all of our students.

3.2 Previous Program Goals from last academic year

Goal	Original Timeline	Actions Taken	Status/Modifications
1 Hire new FTEF	2010-2011	Completed	New hire is currently working on updating engineering courses
2. Develop NANO53 **Develop NANO54** **Complete 1 cycle**	Fall 2011 Winter 2012 Spring 2012	Complete In progress On target	Some development occurred in fall 2011

3.3 New Goals: Goals can be multi-year

Goal	Timeline (long/short-term)	Supporting Action Steps from section 2.4 (if applicable)	How will this goal improve student success or respond to other key college initiatives
1 Support Physics 5 Sequence Introduction	2012-2013	#1	Will improve student retention.
2 Updating Engineering 10, 35, 37/37L, 45 and 49 Nano 51, 52, 53 and 54	2011-2013	#2	Keeping up with the current research on engineering education and with the changes that have occurred in the engineering field is important for providing outstanding educational opportunities.
3 Developing and Updating Engineering courses such as Engr 6 to broaden the courses offered at Foothill	2011-2013	#1 can now accomplish new goals.	Offering more core engineering courses at Foothill will better enable students to transfer without us having to send those students to other colleges.
4. Improving technology use in peer-instruction classes	2012-2013	#4	Students will have a record of what was discussed in class.
5. Lab support	2012-2013	#3	Students will have access to modern lab equipment.
6. Develop sustainable cohort model	Medium – develop an effective strategy before 2012/2013	Work with local workforce boards (WIB/WIA/NOVA) etc	Produce a more sustainable (WSCH), well known program

Section 4: Program Resources and Support

4.1 Using the tables below, summarize your program's resource requests.

Full Time Faculty and/or Staff Positions

Position	$ Amount	Related Goal from Table in section 3.3	Possible funding sources (Lottery, Measure C, Basic Skills, Perkins, etc.)
Engineering & Nano Adjunct faculty supported by NSF		3, 5, 6	NSF-ATE, DOL

Reassigned Time

Position	$ Amount	Related Goal from Table in section 3.3	Possible funding sources (Lottery, Measure C, Basic Skills, Perkins, etc.)
Physics	0.055 FTE	#1	
Engineering	0.111 FTE	#3	
Physics	0.055 FTE	#4	

B Budget Augmentation

B Budget FOAP	$ Amount	Related Goal from Table in section 3.3	Possible funding sources (Lottery, Measure C, Basic Skills, Perkins, etc.)
Physics Show	$5K		
NANO & Sustainability Internships/Scholarships	$20K	3, 5, 6	NST/ATE, DOL and Perkins

Facilities and Equipment

Facilities/Equipment Description	$ Amount	Related Goal from Table in section 3.3	Possible funding sources (Lottery, Measure C, Basic Skills, Perkins, etc.)
Physics purchases for PSEC labs	$120K (not including taxes + S&H, probably true for all of these amounts)	#5	Measure C FF&E
Engineering purchases for PSEC labs	$120,000	#2 and #3	Measure C FF&E
3D Printer	$15K	#2	Measure C FF&E
Machine Shop Equipment	$5K	#5	Measure C FF&E
Student Shop Equipment	$3K	#2 and #5	Measure C FF&E

Equipment Maintenance	$5K	#5	B-Budget
Instructional Technology for Peer Interaction	$45K	#4	Measure C FF&E
SEM (NSF funded)	$70K		NSF-ATE budget
AFM enhancements	$10K		NSF-ATE budget

One-time/Other: (Release time, training, etc.?

Description	**$ Amount**	**Related Goal from Table in section 3.3**	**Possible funding sources (Lottery, Measure C, Basic Skills, Perkins, etc.)**
None			

Section 5: Program Strengths/Opportunities for Improvement

5.1 Use the matrix provided below and, reflect on the program relative to students' needs, briefly analyze the program's strengths and weaknesses and identify opportunities and challenges to the program. Consider external and internal factors, such as demographic, economic, educational, and societal trends. Some considerations may include current and future demand for the program, similar programs at other comparable institutions, and potential auxiliary funding.

	INTERNAL FACTORS	EXTERNAL FACTORS
Strengths	Successful students have a strong record of transferring to four-year institutions. The core full-time faculty enjoys the support of a stable group of part-time faculty. Nano and new sustainability courses have curriculum developed through an NSF-ATE and DOL grant, and is either current or almost finished in development. Faculty understand and practice nanotechnology, and have reasonable currency in industry	The Physics Show has a strong positive presence in the community, as well as an opportunity to get our students excited about teaching physics. Department faculty are well networked with the local physics education community. Local high school community prepares most students well for physics. Many incumbent and transitional workers have a deep appreciation for the role that nanoscience and nanotechnology play in future career exploration.
Weaknesses	Low student success rate in gateway classes. Full-time faculty have not had	

	enough involvement in the Physics 2 series. Current lead Nano faculty has a number of college assignments that either have an opportunity cost or distraction to single focus on this program. While a new co-pi has been identified, it will take some time to build the new material (e.g. laboratory exercises in nanoscience) that are needed for program success. This has left the program with some voids that need to be corrected. The lack of an effective outreach program and/or connection with workforce development has led to historically low enrollments.	 Students are often unaware that Foothill has a nanoscience / nanotechnology program. Evening courses do not always attract the younger students. While there is strong interest in nanotechnology, many people working in industry may not see a community college as the most obvious place to attend
Opportunities	New faculty member has been added to department. Physics will be moving into PSEC in 2012-2013, which will boost enrollment. Large growth in engineering and Nano is anticipated, this will also drive growth in physics. Will have strong awareness from the SLI (Science and Learning Institute) initiative. Collaborations with UCSC, Stanford, etc., might eventually create an awareness of our program as well as derivative benefits from partnering/ academic collaborations.	There are possibilities of outside funding via the SLI, DOE, NSF and other agencies. NOVA and other workforce initiatives may eventually understand the importance of creating a pipeline to community colleges for general education and foundation preparation for transitional workers. Research collaborations at NASA-ASL that also involve novel industry product development could bring both notoriety and outside funding.
Threats	As a lab-based science, physics requires a level of budget support. Budget is a concern across campus.	Physics is sensitive to shifts in the size and makeup of the international student population.

Engineering

	Internal Factors	External Factors
Strengths	Newly updated classes have been well received	Successful students have a strong record of transferring to four-year institutions.

	by the students.	
Weaknesses	Many of the classes need to be updated. New equipment should be purchased.	The engineering classes have low awareness on campus. Fliers indicating the course offering may help.
Opportunities	Newly hired faculty member is currently working on reactivating courses that could not be offered in the past. Engineering will be moving into PSEC in 2012-2013, which will boost enrollment. There will be some potential grant opportunities.	The silicon valley contains many local opportunities for contacts with tech companies and entrepreneurs. NOVA and other workforce initiatives may eventually understand the importance of creating a pipeline to community colleges for general education and foundation preparation for transitional workers. Research collaborations at NASA-ASL that also involve novel industry product development could bring both notoriety and outside funding.
Threats	Engineering equipment and materials should be funded in order to maintain a high quality of instruction.	Engineering equipment and technology changes rapidly. Workforce development remains focused on shorter duration programs.

5.2 Are there any critical issues you expect to face in the coming year? How will you address those challenges?

While the move to the PSEC is a boon in the long run, there may be short-term disruptions. Faculty and staff will carefully plan the move.
NSF may decline an extension in our Nanoscience grant, preventing us from extending our efforts (we have been very frugal with spending).

5.3 What statements of concern have been raised in the course of conducting the program review by faculty, administrators, students, or by any member of the program review team regarding overall program viability?

No concerns about program viability for Physics. Engineering is in a growth mode. NSF/ATE may decline an extension in the NanoScience grant, preventing us from extending our efforts (we have been very frugal with spending).

5.4 Address the concerns or recommendations that were made in prior program review cycles.

Physics student retention over the full sequence of courses remains an issue. The bulk of the losses take place in 4A and 4B. Course outlines have been written for 5ABC and have been articulated with the UC schools. The labs for these classes have also been written and tested. The new sequence will be offered next year.

Ability to dedicate focused time on the Nano program has been a continuing challenge. This is literally a 60 hour a week job, in addition to teaching, developing courses (in nanotechnology and enhancements to clean energy technology).

5.5 After reviewing the data, what <u>strengths or positive trends</u> would you like to highlight about your program?

Physics and engineering are growing both in terms of FTES and FTEF. With the move to PSEC, these should continue.

In the 2012-13 academic year, a full-time physics faculty member will return from PDL, and the new hire will be more strongly integrated into both programs.

Section 6: Feedback and Follow Up

This section is for the Dean to provide feedback.

6.1 Strengths and successes of the program as evidenced by the data and analysis:
The main strengths of the Physics, Engineering and Nano Programs are the Faculty's teaching skills with the goal to have all the students succeed. The other strengths are:

1. Programs have continuous growth in new curriculum as well as student enrollment.
2. The students are successful when they transfer.
3. Have been successful in receiving grants and external funds.
4. Hiring of a FT Faculty member to provide direction to the core Engineering program.
5. Some members are very creative in the use of technology in the classroom to engage students.
6. The Physics Show has been an exceptional community outreach program.
7. The development of new engineering curriculum for nanotechnology as well as energy. The cross-disciplinary nature of physics-engineering-nano permits faculty to address new curriculum from a broad manner.

6.2 Areas of concern, if any:

There are number of areas of concern:

1. The student success in a physics (engineering doesn't really have a sequence) sequences is a major concern. Two major factors appear to be that students are 1) ill prepared in math fundamentals and 2) being college ready. These students are often the ones that are taking too many credits during the college quarter. With Foothill College's demographics shifting towards high school districts that have a history of under

preparing their students to be successful in science and math, there will be new pressure to remediate the students at the same time they are taking core courses.

2. The next concern is providing the faculty adequate time outside of the classroom to be innovative, do research in physics pedagogy, and develop completely new physics courses to meet the demands of today's students. Some faculty are spread thin developing external relationships, working proposals and grants.
3. The next concern is the professional development for the full-time faculty but more importantly the part-time faculty in the use of technology, common standards for student success in a course as well as the sequence, and new teaching techniques and methodology. There is a lot of discussion of new STEM pedagogy and use of external materials such as Kahn Academy.
4. Much of the new course development and rejuvenation is falling upon new FT Faculty as well as a number of Adjuncts. This will be difficult to sustain without external funding. The positive side is with external funding permits great PT faculty to focus on FH fulltime.
5. The desire to create on campus STEM research projects for students, in combination with internships at 4 year colleges in the area.

6.3 Recommendations for improvement:

There are always areas for improvement in education and math has been a popular topic. The recommendations are tied to the 6.2 Concerns list.

1. 6.2.1 Decline:
    a. The faculty have developed Physics 5 A/B/C series with the goal of early retention on students.
    b. Identify a list of math skills assessment and remediation. Potentially using Khan Academy.
    c. The Physics 2 series requires a FT faculty to review and revamp the sequence & labs.
2. 6.2.1 Student Outside Demands:
    a. Provide pre-collegiate math students financial “support package”
    b. Develop special contracts based on course success and levels of participation in their classes
3. 6.2.1 Student’s Skills:
    a. Identify a FH Math Tool to assess students math preparedness
    b. Identify approaches for remediation
    c. Develop a department level approach
    d. Present a plan to PARC
4. 6.2.1 PSME Center:
    a. The Center requires a FT Faculty to develop new curriculum and provide coordination between Math Classes with Center support.
    b. Additional Graduate Student staff required supporting start of quarter assessments as well as remedial/booster class support.
    c. Identify and fund a publisher independent LMS for centralized course materials, assessments, homework and student tracking from course to course.
5. 6.2.2, 6.2.4, 6.2.5 Faculty Time:
    a. Provide 1 quarter (1 qtr or over 3 qtrs) reassign time based on agreed upon projects for on campus student research & Physics 2 series.

b. Use external funds such as grants and Foundation funds when possible to fund both FT & PT faculty
c. Create long term program sequence including MESA in 2013.

6. 6.2.3 Professional Development:
   a. Invite STEM "experts" for lectures or 1 quarter visiting professor
   b. Develop quarterly ½ day seminars for FT & PT
      i. Pay PT $100 stipend
   c. Provide FT faculty reassign time to collaborate with local colleges (Stanford, UCSC) and Foundations (Gates, Carnegie, Packard).
      i. Use external funds such as grants and Foundation funds when possible
      ii. Contact colleges Foundations and Colleges.

6.4 Recommended Next steps:
_x_ Proceed as planned on program review schedule
___ Further review/Out of cycle in-depth review

Unit Course Assessment Report - Four Column

Foothill College

Department - Engineering (ENGR)

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Engineering Problem Solving - Identify, formulate and solve problems that have real world constraints (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Documentation from the design project **Assessment Method Type:** Class/Lab Project **Target for Success:** 75% of the class will receive a B or better on the design project documentation.		
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Engineering Commuication - Communicate effectively through written documents and oral presentations (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Oral presentation to the class on the design project. **Assessment Method Type:** Presentation/Performance **Target for Success:** 90% of the class shows improvement in oral communication skills between the first and last oral presentations.		
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Engineering Process - Work as a contributing member of a functional team (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Peer survey. Survey completed by team members at the end of the project. **Assessment Method Type:** Survey **Target for Success:** 80% of the class being rated as "Satisfactory" or better by their team members.		
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Application of Knowledge - An ability to apply knowledge of mathematics, science and			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
engineering. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Complex Problem Solving - Collaborative skills to solve complex problems via verbal communication, writing and presentation in a structured format. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 35 - STATICS - Particles and Rigid Bodies - The student be able to determine the equilibrium of particles and rigid bodies in two and three dimensions (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 35 - STATICS - Forces, Centroid and Moments of Inertia - The student will be able to analyze the forces, centroid and moments of inertia on structures, such as: - Trusses - Frames - Beams - Cables (Created By Department - Engineering (ENGR))			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Assessment Cycles: 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 37 - INTRODUCTION TO CIRCUIT ANALYSIS - Direct and Alternating Current - Students will correctly identify the production, characteristics, applications, and voltage change methods of Direct Current and Alternating Current. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 37 - INTRODUCTION TO CIRCUIT ANALYSIS - Quantities of DC and AC Circuits - Students will correctly calculate quantities in DC and AC circuits containing resistive devices,capacitors, and inductors using Ohm?s and Watt?s Laws, Kirchoff?s Laws, and appropriate circuit analysis methods. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 37 - INTRODUCTION TO CIRCUIT ANALYSIS - Laboratory Measurements - Students will correctly perform measurements using multimeters, oscilloscopes, and signal generators, perform circuit fabrication using electronic			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
schematic diagrams, and perform simple problem-isolation techniques on laboratory circuits. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 45 - PROPERTIES OF MATERIALS - Classess of Materials - To ensure that our students are knowledgeable about all classes of materials and their structure, properties, processing, applications and performance; (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 45 - PROPERTIES OF MATERIALS - Real Materials engineering Problems - To ensure that our students can properly relate their hands-on laboratory experiences to solving real materials engineering problems (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 49 - ENGINEERING PROFESSION - Self Analysis and Career Research - Identify one's interest in a engineer field(s) via self analysis and career research. (Created By Department - Engineering (ENGR))	**Assessment Method:** 7-10 page essay on engineering career plan. **Assessment Method Type:** Essay/Journal **Target for Success:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Assessment Cycles: 2011-2012 **Course-Level SLO Status:** Active	85% of students receive a grade of B or better.		
Department - Engineering (ENGR) - ENGR 49 - ENGINEERING PROFESSION - Engineering Responsibilities - An understanding of professional, ethical, legal, security, and social issues and responsibilities (Created By Department - Engineering (ENGR)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Class discussion on ethical issues and responsibilities in engineering. **Assessment Method Type:** Discussion/Participation **Target for Success:** 75% of the class contributing to the discussion.		

Foothill College

Program (PSME - ENGR) - Engineering AS

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
Program (PSME - ENGR) - Engineering AS - 1 - Formulate logical problem solving approaches, generate solutions, and assess the reasonableness of the solutions for engineering type analysis problems. **PL-SLO Status:** Active			
Program (PSME - ENGR) - Engineering AS - 2 - Design, construct, and produce creative solutions to engineering problems by applying the engineering design process and identifying pertinent design parameters based on the fundamental physics governing a system. **PL-SLO Status:** Active			
Program (PSME - ENGR) - Engineering AS - 3 - Demonstrated understanding of the fundamental knowledge necessary for the practice of, or for advanced study in, engineering, including scientific principles, rigorous analysis, and problem solving. **PL-SLO Status:** Active			
Program (PSME - ENGR) - Engineering AS - 4 - Demonstrated clear communication skills, responsible teamwork, professional attitudes and ethics. **PL-SLO Status:** Active			
Program (PSME - ENGR) - Engineering AS - 5 - Demonstrated a preparation for the complex work environment and continuous			

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
learning. **PL-SLO Status:** Active			

Unit Course Assessment Report - Four Column

Foothill College

Department - Nanotechnology (NANO)

Mission Statement: Provide technicians training for students and working professionals practicing nanomaterials engineering

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Applications - students will describe the industrial applications of nanotechnology, with specific instances (applications) in semiconductors, high performance materials, (and suggested) energy, food, water, computing, and medicine - assessment by written evaluation. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Start Date:** 09/01/2011 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** Students write a midterm assignment studying an application of nanotechnology including analysis of an industrial application, a company working in that area, and the technical approach taken to solve that problem. **Assessment Method Type:** Case Study/Analysis **Target for Success:** Ability to communicate a problem space (industrial application) and why it is important, the reason behind the technical approach taken, and how a company will bring this particular solution into the market place.	11/15/2011 - Students successfully completed a case study analysis of a key application in nanotechnology. Students with four-year degrees were able to complete the task with ease, while younger (typical) students struggled a bit. In addition to essays, we will consider having a final class presentation (as conducted by Jill Johnsen in winter 2011). A combination of essay and class presentation would help other students benefit from individual research. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Field of Nanotechnology - students will describe the field of nanotechnology from a historical perspective, and emergent / convergent from physics, materials science and engineering, semicondutors and electronics, biology and chemistry - assessment by written evaluation (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Weekly writing assignment **Assessment Method Type:** Discussion/Participation **Target for Success:** Ability to communicate the history and contest of Nanotechnology, as integrative of but also distinct from chemistry, physics, and materials science	12/05/2011 - Students had only a weak understanding of nanoscale phenomenon as distinct (or integrative) of chemistry, physics, and biology. **Result:** Target Not Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** This assignment gave a lot of students difficulty, especially if they have not completed a college level chemistry, physics, and/or biology course. It is important to lay a foundation for nanoscience as distinct (or integrative) of other sciences. We did work on vocabulary	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
		(mesoscale phenomenon).	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Material Engineering - students will describe the material engineering and application challenges in energy, food, water, computing, and medicine - assessment by written evaluation. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Weekly writing assignment **Assessment Method Type:** Discussion/Participation **Target for Success:** Ability to communicate the need for new materials and materials engineering solutions in the field of energy, food, water, computing, and medicine.	12/05/2011 - Most students were able to describe the materials challenges in energy, water, medicine, and computation. Most students clearly understood there were materials development challenges in these areas, and nanomaterials engineering would lead to novel properties in addressing many of these issues. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** A good simple SLO, and one lecture in class addressed the topic perfectly.	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Nanoengineering - students will describe how nanotechnology and nanoengineering are practiced in industry, including thin film deposition, particle size, distribution, and surface area, grain boundary engineering, lattice dimension / strain - students will describe the material engineering and application challenges in energy, food, water, computing, and medicine - assessment by written evaluation. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Weekly writing assignment **Assessment Method Type:** Discussion/Participation **Target for Success:** Ability to communicate how nanotechnology and nanomaterials engineering is used in industry, and specifically the technical approaches to solving problems in application development.	12/05/2011 - Most students were able to find industry applications of nanotechnology that they could relate to. Most had one or two areas where they understood how nanotechnology was used, such as in an iPod, a computer, energy, or nano-medicine. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** Straightforward and led to the midterm writing assignment, which probably reinforced this SLO. Need to measure how many application areas they learn by the end of the course.	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO	**Assessment Method:** Weekly writing assignment	12/05/2011 - Most students were able to identify about 5 nanostructures at most, and not without	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
NANOTECHNOLOGY - Nanostructures - students will identify ten key nanostructures, how they are prepared, and why they are important in nanoscience and materials engineering - assessment by written evaluation. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method Type:** Discussion/Participation **Target for Success:** Students will identify and define ten key nanostructures and why they are important in nanotechnology. Can including structure => property relationships as well as industry applications	considerable help from the course notes and Wikipedia. **Result:** Target Not Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** It might be either too early to ask them to do this, or it could be that it takes iterative passes through this content to begin to master nanostructures.	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - PNPA Rubric - students will learn and apply the PNPA rubric to key application and product engineering challenges - as a method for applying the engineering method to advanced materials engineering - assessment by written evaluation. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Final writing assignment **Assessment Method Type:** Research Paper **Target for Success:** Ability to integrate the PNPA rubric into an industry application (nanotechnology or area of research (nanoscience). Demonstrate understanding of processing => structures => properties => applications	12/05/2011 - Most students were only vaguely aware of PNPA and could not find an immediate use for the rubric. **Result:** Target Not Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** We will need to spend much more time on this in NANO51 beginning in winter 2012	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Properties Relationships - students will apply theory of atomic, electronic, and material structure to Modeling and Simulation, Engineering, and Structure - Properties Relationships. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:**	**Assessment Method:** weekly writing assignment **Assessment Method Type:** Discussion/Participation **Target for Success:** Ability to describe how particular properties emerge from molecular/electronic structures etc., and a general understanding of structure => property relationships.	12/05/2011 - Most students had a rough idea of structure => property relationships, especially if they previously had studies materials, or taken chemistry past organic. For students with only one college course this was a stretch for them to articulate. **Result:** Target Not Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** Degree holding students had a clear	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Active		advantage in articulating structure => property relationships. This topic may require a number of lectures for students to master.	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Fabricating Nanostructure - students will identify the primary process tools for fabricating nanostructured materials, how they work, and where they fit into both academic research and industrial laboratories and manufacturing. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignments **Assessment Method Type:** Discussion/Participation **Target for Success:** Ability to identify basic approaches to nanofabrication from a tools and process perspective. May integrate a notion of key nanostructures, properties, and applications.	12/05/2011 - Students were able to grasp thin films and semiconductors, but topics including nanochemistry were a little challenging for over half the group. **Result:** Target Not Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** Degree holders especially with chemistry, physics, biology, and some industry experience did reasonable well. Students with minimal science struggled with this.	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO NANOTECHNOLOGY - Characterization Tools and Methods - students will identify the primary process tools for characterizing nanostructured materials, how they work, and where they fit into both academic research and industrial laboratories and manufacturing (QA/QC). (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Start Date:** 09/01/2011 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignment **Assessment Method Type:** Discussion/Participation **Target for Success:** Ability to identify typical instruments and methods used in characterizing nanomaterials, nanostructures, and elucidating structure property relationships.	12/05/2011 - Surprisingly students did a pretty good job with this assignment - and were able to articulate both the names and functions of tools, and additionally materials that could be analyzed with each method. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** Success of this SLO might be due in part to the experience of the faculty in these tools and methods. This might be a case of both knowledge and enthusiasm rubbing off on students.	
Department - Nanotechnology (NANO) - NANO 50 - INTRODUCTION TO	**Assessment Method:** weekly writing assignment	12/05/2011 - We are just beginning our discussion of this topic. Hopefully there will be enthusiasm in	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
NANOTECHNOLOGY - Emergent and Converget Nanotechnology - students will identify and discuss the current challenges to nanotechnology and nanoengineering in policy, education, funding, legal, and environmental applications and identify and discuss the future emergent and convergent areas of nanotechnoy, including quantum computing, synthethic biology, and IT/MEMS (nanorobotics) (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method Type:** Discussion/Participation **Target for Success:** Describe the convergence of nanotechnology, biology, physics, etc., and the legal and policy implications of nanotechnology. Identify where funding of research is needed.	learning about future technology goals of nanotechnology, and how policy and investment can accelerate development of new nanomaterials / engineering innovation. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** Work in progress	
Department - Nanotechnology (NANO) - NANO 51 - APPLICATIONS OF NANOTECHNOLOGY - Fundamental Concepts of Nanoscience - What are (some of the) fundamental tenants of nanoscience? (Emergence of properties at scale, self-assembly, surface area effects, and emergence of nanosystems). (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignments and midterm/final writing assignments **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe key ideas / concepts in nanoscience and how / why they are important in nanotechnology. Three key ideas are self-assembly, surfaces, and emergence of properties at scale.		
Department - Nanotechnology (NANO) - NANO 51 - APPLICATIONS OF NANOTECHNOLOGY - Key Nanostructures used in Nanotechnology - What are the 10-20 key nanostructures used in industry? (Apply PNPA to each in a top-level manner) (fullerenes, nanotubes, thin films, and dendrimers) (Created By Department -	**Assessment Method:** weekly writing assignments and midterm/final essays **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe ten to twenty key nanostructures and how and why they are used in industry.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Nanotechnology (NANO)) **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	Include a description of PNPA processing => structures => properties => applications, and how PNPA is used in industry / nanomaterials engineering.		
Department - Nanotechnology (NANO) - NANO 51 - APPLICATIONS OF NANOTECHNOLOGY - Fundamental Applications of Nanotechnology - What are the fundamental problems addressed and industries using nanoscience and nanoengineering? Use PNPA, and how does it relate to the actual hands-on practice of nanomaterials engineering? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** midterm/final writing assignment **Assessment Method Type:** Case Study/Analysis **Target for Success:** Describe fundamental problems in industry requiring novel materials / properties, and how / where nanomaterials engineering is used to find solutions to those problems. Integrate PNPA: processing => structures => applications => properties into the discussion of nanomaterials engineering for application development.		
Department - Nanotechnology (NANO) - NANO 52 - NANOMATERIALS & NANOSTRUCTURES - Key Nanostructures used in Nanotechnology - What are the key 10 to 12 nanostructures used in nanotechnology, and what are their composition and structure. Why are they important and what industries use them to solve what types of problems? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013	**Assessment Method:** weekly writing assignments and midterm/final writing assignment **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe ten to twelve key nanostructures in terms of their elemental composition, molecular and electronic structures, and how/why they are important in nanoscience and nanotechnology. Integrate PNPA (fundamental structure => properties)		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Course-Level SLO Status: Active			
Department - Nanotechnology (NANO) - NANO 52 - NANOMATERIALS & NANOSTRUCTURES - Structure => Property Relationships - How do properties arise from key nanostructures? Using the systems archetype model: networks of atoms, systems of physics, and emergence of properties at scale. (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignment **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Ability to describe fundamental interactions (physics) at the level of molecular and electronic structure that lead to the emergence of properties, and specific structure => property relationships. Ideally integrate the nanopatterns pedagogy of networks of atoms => systems of physics => and emergence of properties at scale.		
Department - Nanotechnology (NANO) - NANO 52 - NANOMATERIALS & NANOSTRUCTURES - Characterization and Fabrication of Key Nanostructures - What are the primary fabrication and characterization tools for the key 10 - 12 nanostructures used in nanotechnology? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** midterm/final writing assignments **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Ability to describe process and characterization tools and methods for fabricating and characterizing key nanostructures. Ideally integrate PNPA rubric: process => structures => properties => applications that tie tools to structure => properties.		
Department - Nanotechnology (NANO) - NANO 53 - NANOMATERIALS CHARACTERIZATION - Structure Characterization Tools - What combination	**Assessment Method:** weekly writing assignments and midterm/final writing assignment or project	12/06/2011 - Students were able to describe the appropriate tools for composition, chemistry, and structure, and had the ability (with notes) to align	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
of instruments are used to characterize the composition, chemistry, and structure of a material? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 09/01/2011 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe the selection and use of characterization tools to determine composition, chemistry, structure of a material, to support process development, and FA/QA/QC of nanomaterials and devices.	tools, nanostructures, and industry. Performance varied based on experience. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** Degree holders and especially students with industry experience were able to do this more successfully than students with minimal technician level experience.	
Department - Nanotechnology (NANO) - NANO 53 - NANOMATERIALS CHARACTERIZATION - Property Characterization Tools - What combination of instruments are used to characterize the physical properties of materials? How are structure-property relationships determined? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2011-2012 **Start Date:** 09/01/2011 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignments and midterm/final writing assignment or project **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe key tools and methods for determining material properties (physical, electrical, optical, magnetic, etc.) and elucidation of structure => property relationships	12/06/2011 - Properties measurements were much more difficult for students to assign. The IL-SLO reflection will show that lack of experience with many properties tools made this much more difficult. **Result:** Target Not Met **Year This Assessment Occurred:** 2011-2012 **IL-SLO Reflection:** As noted above, lack of industry experience in physical properties made this a more difficult task for the instructor - and more time will be invested in this are as the course is taught again.	
Department - Nanotechnology (NANO) - NANO 53 - NANOMATERIALS CHARACTERIZATION - Approaches to Failure Analysis and Materials Characterization - What are are typical approaches to failure analysis, materials characterization, and QA/QC (for nanostructures, nanomaterials, devices and industries)? (Created By Department - Nanotechnology (NANO))	**Assessment Method:** weekly writing assignments and midterm/final writing assignment or project **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe approaches to failure analysis, materials characterization, and QA/QC using specific tools for key problems/devices in targeted industries.	12/06/2011 - This assignment is still in progress but advanced students have already made significant progress on this. It appears that students will be very detailed in one type of industry but not so familiar with other industries. This will require more online materials to support extended learning. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Assessment Cycles: 2011-2012 **Start Date:** 09/01/2011 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active		**IL-SLO Reflection:** As noted above, most students will have good success in relating an approach to materials characterization, problem solving, failure analysis, or QA/QC in one type of industry (semiconductors, magnetic storage, thin films, biomedical devices. etc , much better than the other industries. This might require extended online material for students to use after the course is completed.	
Department - Nanotechnology (NANO) - NANO 54 - NANOFABRICATION TOOLS & PROCESS - Process Tools and Techniques - What are the key process tools and techniques used to fabricate nanomaterials and nanostructures? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignments and midterm/final writing assignment or project **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe key process tools and techniques for fabrication of nanomaterials and devices used in high technology industry (semiconductors, magnetic media, biomedical devices, etc). Explain why specific tools and processes are used.		
Department - Nanotechnology (NANO) - NANO 54 - NANOFABRICATION TOOLS & PROCESS - Process Optimization - What are the key methods and approaches to process optimization, including optimizing process => structure => properties (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013	**Assessment Method:** weekly writing assignments and midterm/final writing assignment or project **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe approaches for process optimization, including diagraming process intervention points, characterization tools, and tying structure => property relationships to to process => structure relationships, and demonstrating the turnkey / interlocked relationships in the PNPA rubric.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Course-Level SLO Status: Active			
Department - Nanotechnology (NANO) - NANO 54 - NANOFABRICATION TOOLS & PROCESS - Process Reproducibility - What are the key methods and approaches to achieving process reproducibility, and what QA/QC methods are also employed in that process? (Created By Department - Nanotechnology (NANO)) **Assessment Cycles:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **Course-Level SLO Status:** Active	**Assessment Method:** weekly writing assignments and midterm/final writing assignment or project **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Describe methods and approaches to achieving process reproducibility, including flow charts, process diagrams, and points of intervention, for nanofabrication and processing (manufacturing) in high-tech related industries (semiconductors, thin films, magnetic media, and biomedical devices).		

Unit Assessment Report - Four Column

Foothill College

Program (PSME - NANO) - Nanoscience AS/CA

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
Program (PSME - NANO) - Nanoscience AS/CA - Nanoscience / Nanotechnology Competency - Technicians will apply foundational nanoscience principles to understanding and further learning about nanostructures, properties, and engineering solutions (read and apply literature, seminars, and webinars). Demonstrate through written assignments (diagrams etc.), term papers, and class presentations. Use PNPA as a way to read and learn from technical writing articles **Year PL-SLO implemented:** 2011-2012 2012-2013 2013-2014 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **PL-SLO Status:** Active	**Assessment Method:** Students use case studies in nanoscience (research) and nanotechnology (commercial applications) to demonstrate an understanding of the relationships between processing => structure => properties => applications, and how scientists and engineers leverage structure => property relationships for nanomaterials selection, and how new fabrication methods produce novel nanostructures with unique / tailored properties. **Assessment Method Type:** Case Study/Analysis		
Program (PSME - NANO) - Nanoscience AS/CA - Nanomaterials Engineering - Technicians will develop effective engineering plans for developing materials engineering solutions for industrial applications (using PNPA). These include applying characterization skills to elucidating structure=> property relationships, process optimization (for desired properties) and consistent material manufacturing. Demonstrate through term projects (diagrams etc.), engineering lab experiments, and class presentations,	**Assessment Method:** Students will demonstrate an understanding of effective nanomaterials engineering practice through class lab projects where they will design / describe / document a path from processing => structure => (characterization) => properties => applications. **Assessment Method Type:** Class/Lab Project		

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
Year PL-SLO implemented: 2011-2012 2012-2013 2013-2014 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **PL-SLO Status:** Active			
Program (PSME - NANO) - Nanoscience AS/CA - Nanotechnician Competency - Technicians will support fundamental R&D, process development, characterization (including QA/QC FA etc.) and consistent / good manufacturing practice (in all sizes of high technology firms). Demonstrate through internship and work experience. **Year PL-SLO implemented:** 2011-2012 2012-2013 2013-2014 **Start Date:** 01/01/2012 **End Date:** 01/01/2013 **PL-SLO Status:** Active	**Assessment Method:** Students will demonstrate an ability to effectively practice the integrated nanomaterials engineering method (PNPA rubric) in a working / research environment. Students will practice processing/fabrication, characterization, and working to develop/optimize a fabrication/processing method. Could be capstone experience in a laboratory, internship, or incumbent working experience. **Assessment Method Type:** Field Placement/Internship		
Program (PSME - NANO) - Nanoscience AS/CA - Nanosystem Competency - Understand nanostructures as nanosystems: extended (ordered or patterned) networks of atoms and forces, from which properties emerge at scale. **Year PL-SLO implemented:** 2012-2013 **Start Date:** 01/01/2012 **End Date:** 01/01/2013	**Assessment Method:** Students will submit a research paper showing an understanding of nanostructures as networks of atoms, systems of physics, and emergence of properties at scale. This is an advanced concept in nanoscience and an emerging pedagogical tool. **Assessment Method Type:** Research Paper		

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
PL-SLO Status: Active			

Unit Assessment Report - Four Column

Foothill College

Program (PSME - PHYS) - Physics AS

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
Program (PSME - PHYS) - Physics AS - 1 - Students know basic physics principles **PL-SLO Status:** Active	**Assessment Method:** We want the students to demonstrate the knowledge below. These items are tested in the course finals for Physics 4A, 4B, 4C and 4D. The exams act as assessment. 1.1 Students can demonstrate an understanding of Newton?s laws 1.2 Students can demonstrate an understanding of Maxwell?s equations 1.3 Students can demonstrate an understanding of the Schrödinger equation 1.4 Students can answer qualitative and quantitative problems in classical mechanics 1.5 Students can answer qualitative and quantitative problems in electricity and magnetism 1.6 Students can answer qualitative and quantitative problems in quantum mechanics 1.7 Students can demonstrate an understanding of the thermodynamics and statistical mechanics **Assessment Method Type:** Exam - Course Test/Quiz		
Program (PSME - PHYS) - Physics AS - 2 - Students can apply their knowledge to practical, theoretical and experimental problems **PL-SLO Status:** Active	**Assessment Method:** PLO #2 for the Physics department involves mastery of lab skills. The Physics 4D labs are high-level. An inspection of lab reports from that class serves as assessment for PLO #2. 2.1 Students can analyze experimental results and draw reasonable		

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
	conclusions from them. 2.2 Students can interpret experimental data to draw meaningful conclusions from properly conducted experiments **Assessment Method Type:** Essay/Journal		
Program (PSME - PHYS) - Physics AS - 3 - Students are prepared to advance to the next step in careers in science, industry and education. **PL-SLO Status:** Active	**Assessment Method:** PLO #3 for Physics describes mastery of lower-level lab skills. Evaluation of this PLO will consist of discussions with lab faculty. 3.1 Students can identify and use standard laboratory equipment and instrumentation 3.2 Students have developed critical thinking skills (and can apply these skills to solving problems in physics) 3.3 Students are proﬁcient using standard software tools (such as Mathematica, Excel and Word) for modeling, data analysis and report writing **Assessment Method Type:** Departmental Questions		

Unit Course Assessment Report - Four Column

Foothill College

Department - Physics (PHYS)

Mission Statement: The mission of the Physics department is to provide undergraduate education founded on a rigorous, applied treatment of physics? fundamentals coupled with experiential experiences and a broad commitment to generate and disseminate knowledge.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 100 - PHYSICS STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 100 - PHYSICS STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 100X - PHYSICS STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 100X - PHYSICS STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 100Y - PHYSICS STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 100Y - PHYSICS STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 12 - INTRODUCTION TO MODERN PHYSICS - Reflecting on Physics 12 - 1. Students will understand their objectives for taking this course 2. Students will, when the course is over, reflect on how well the course met their objectives (Created By Department - Physics (PHYS))	**Assessment Method:** Students received a survey on the first day of the class and then received another survey (based on the first) on the last day of the class. Students were asked to reflect on their objectives and how well the course met them. **Assessment Method Type:**	11/13/2011 - During the pre-survey, the following were the top objectives in taking the course: 1. really understanding something about the theories of relativity - 54 2. knowing more about Einstein's life and outlook - 53 3. really understanding something about atoms & quantum mechanics - 50	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Assessment Cycles: 2010-2011 **Start Date:** 12/01/2010 **End Date:** 06/30/2011 **Course-Level SLO Status:** Active	Survey **Target for Success:** The majority of students in the class report that the class met the objectives which they had set.	4. learning about the history of physics - 39 5. being able to explain Einstein's work to others - 36 In the post-survey, students were asked to rate how well the course met these objectives. a = not at all b = some c = very well Here is how each of the above objectives was rated: 1. relativity: a = 0, b = 6, c = 40 2. Einstein: a = 0, b = 3, c = 40 3. atoms & qm: a = 0, b = 12, c = 35 4. history: a = 0, b = 3, c = 33 5. explain to others: a = 1, b = 13, c = 29 **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	
Department - Physics (PHYS) - PHYS 2A - GENERAL PHYSICS - Kinematics, Newton's Laws, Energy, and Momentum - Students should be able to solve problems involving Kinematics, Newton's Laws, Energy, and Momentum, and know when to use which concept. (Created By Department - Physics (PHYS))	**Assessment Method:** Students will be pre and post-tested with the Mechanics Baseline Test, a standardized test from the Physics Education Reseach community. **Assessment Method Type:** Exam - Standardized	12/15/2010 - Pretest Average = 9.2 +/- 0.4 Posttest = 13.0 +/- 0.6 Hake gain = 0.23 +/- 0.04 Again, national average is 0.23, so our department is in the norm. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	12/15/2010 - The Physics 2 series has grown in terms of WSCH over the past few years, but has not had a full-timer consistently assigned to the courses. The department should designate a professor to take the role of reponisbility for the sequence. David Marasco will start in the 2 series when he comes of off PDL in the 2012-13 academic yet.
		06/30/2010 - Pre test average = 8.79 Post test average = 12.47 (these are out of 26) Hake gain = 0.21 National average Hake gain = 0.23 **Result:** Target Met **Year This Assessment Occurred:**	06/30/2010 - The instructors felt that more demos would be helpful, and requested a list of what we have available. Also note that the students in the 2 sequence are motivated mainly by

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
		2010-2011	their grades, and did not take an assessment that had no effect on their grades seriously. This was worse in the night classes, where people would simply guess and turn in the assessments so they could leave early.
Department - Physics (PHYS) - PHYS 2A - GENERAL PHYSICS - Lab Experiments - Via lab experiments, students will have an understanding of the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS))	**Assessment Method:** Instructors will examine an experiment with an eye towards major revision. **Assessment Method Type:** Departmental Questions		
Department - Physics (PHYS) - PHYS 2B - GENERAL PHYSICS - Concepts in E&M - Students should be able to solve problems involving the relationships between charges, forces and fields for both electricity and magnetism, the concept of voltage, and simple circuits. (Created By Department - Physics (PHYS))	**Assessment Method:** Students will be pre- and post-tested using a standardized exam. **Assessment Method Type:** Exam - Standardized	04/01/2011 - Our main finding was that our assessment tool was flawed. There was some poor implementation - a flipped page in the test meant that we couldn't correlate certain questions on the scantron sheets, and had to throw them from the sample. The test questions were probably also too hard. We saw Hake gains of roughly 0.1, which is half of the national average for a "typical" test. Given that this was over two different professors, we need to look hard at the test. Also, the test was numerical, and no formulas were given to the students. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	04/01/2011 - Need to reform the pre-post tests, taking out problems that are too hard. Also, since we don't ask students to memorize formulas for their typical exams, if we have a pre- and post-test, we need to provide formula sheets.
Department - Physics (PHYS) - PHYS 2B - GENERAL PHYSICS - Thermodynamics -	**Assessment Method:** Students will be pre- and post-tested with a	04/01/2011 - Our main finding was that our assessment tool was flawed. There was some	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Students should understand the following concepts from Thermodynamics: 1. Distinctions between temperature, heat and energy. 2. PV diagrams 3. First and Second Laws of Thermodynamics (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	standardized exam.	poor implementation - a flipped page in the test meant that we couldn't correlate certain questions on the scantron sheets, and had to throw them from the sample. The test questions were probably also too hard. We saw Hake gains of roughly 0.1, which is half of the national average for a "typical" test. Given that this was over two different professors, we need to look hard at the test. Also, the test was numerical, and no formulas were given to the students. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	04/01/2011 - We need to recalibrate the exam, removing the more difficult items, and providing a formula sheet, as we don't ask our students to memorize physics equations.
Department - Physics (PHYS) - PHYS 2B - GENERAL PHYSICS - Lab Experiments - Lab experiments should teach students the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Either via examination of lab books or in class observation, instructors should evaluate labs for improvement. **Assessment Method Type:** Essay/Journal		
Department - Physics (PHYS) - PHYS 2C - GENERAL PHYSICS - Waves - Students should demonstrate competence in waves, including: Sound E&M Waves Interference (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** At least one question on the midterm and final shall cover the topics in this SLO. The instructor will evauluate students' performance. **Assessment Method Type:** Exam - Course Test/Quiz	06/30/2011 - The initial trial of this SLO was with a standardized exam, pre- and post-tested. This showed poor results for both performance and improvement. This can be attributed to two factors, as seen in the reflections. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2011 - The students did poorly for two reasons, the fact that the test did not give them access to equations (normally they get a "cheat sheet" for their exams), and that this population is a very grade-driven one, and the SLO exam had no affect on their grades. It was decided that since we offer only one lecture section of 2C, an examination of their midterms and finals is a better instrument.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 2C - GENERAL PHYSICS - Optics - Students should demonstrate competence in optics, including: Relection Refraction Lenses Mirrors (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** At least one question on the midterm and final shall cover the topics in this SLO. The instructor will evauluate students' performance. **Assessment Method Type:** Exam - Course Test/Quiz	06/30/2011 - The initial trial of this SLO was with a standardized exam, pre- and post-tested. This showed poor results for both performance and improvement. This can be attributed to two factors, as seen in the reflections. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2011 - The students did poorly for two reasons, the fact that the test did not give them access to equations (normally they get a "cheat sheet" for their exams), and that this population is a very grade-driven one, and the SLO exam had no affect on their grades. It was decided that since we offer only one lecture section of 2C, an examination of their midterms and finals is a better instrument.
Department - Physics (PHYS) - PHYS 2C - GENERAL PHYSICS - Modern Physics - Students should demonstrate competence in Modern Physics, including Special Relativity Wave Nature of Quantum Physics (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** At least one question on the midterm and final shall cover the topics in this SLO. The instructor will evauluate students' performance. **Assessment Method Type:** Exam - Course Test/Quiz	06/30/2011 - The initial trial of this SLO was with a standardized exam, pre- and post-tested. This showed poor results for both performance and improvement. This can be attributed to two factors, as seen in the reflections. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2011 - The students did poorly for two reasons, the fact that the test did not give them access to equations (normally they get a "cheat sheet" for their exams), and that this population is a very grade-driven one, and the SLO exam had no affect on their grades. It was decided that since we offer only one lecture section of 2C, an examination of their midterms and finals is a better instrument.
Department - Physics (PHYS) - PHYS 2C - GENERAL PHYSICS - Lab Experiments - Labs experiments should teach the students the background science, error analysis and how to perform experiments. (Created By Department - Physics (PHYS))	**Assessment Method:** Either by review of lab reports, in-class observation, or independent study, instructors should evaluate the lab experiments on an ongoing basis. **Assessment Method Type:** Essay/Journal		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Assessment Cycles: 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 34H - HONORS INSTITUTE SEMINAR IN PHYSICS - Physical/Conceptual Understanding - Students have a physical/conceptual understanding of a topic investigated in class. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** As this class is a seminar, the students will share their knowledge via in-class discussion, evaluated by the instructor. **Assessment Method Type:** Discussion/Participation	06/30/2011 - This class was centered on the Space Shuttle, as NASA was retiring it during the time frame and it was therefore topical. Students picked topics, and explained them to the rest of the class. The students who were not speaking that day were tasked with asking questions at an appropriate level. The class performed to the expectations of the instructor. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2011 - This class ran with four students. Perhaps Physics 34H is running in a bad quarter, or at a bad time. We should talk to the Honors Program about this.
Department - Physics (PHYS) - PHYS 34H - HONORS INSTITUTE SEMINAR IN PHYSICS - Mathematical Understanding - Students have a mathematical understanding of a topic investigated in class. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** As this class is a seminar, the students will share their knowledge via in-class discussion, evaluated by the instructor. **Assessment Method Type:** Discussion/Participation		
Department - Physics (PHYS) - PHYS 36 - SPECIAL PROJECTS IN PHYSICS - Topic Investigation - Students have a understanding of a topic investigated in class. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:**			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Active			
Department - Physics (PHYS) - PHYS 36 - SPECIAL PROJECTS IN PHYSICS - Communicate Understanding - Students can convey this understanding in written and/or oral form. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 36X - SPECIAL PROJECTS IN PHYSICS - Topic Investigation - Students have a understanding of a topic investigated in class. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 36X - SPECIAL PROJECTS IN PHYSICS - Communicate Understanding - Students can convey this understanding in written and/or oral form. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 36Y - SPECIAL PROJECTS IN PHYSICS - Topic Investigation - Students have a understanding of a topic investigated in class. (Created By Department - Physics (PHYS))			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Assessment Cycles: 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 36Y - SPECIAL PROJECTS IN PHYSICS - Communicate Understanding - Students can convey this understanding in written and/or oral form. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 4A - GENERAL PHYSICS (CALCULUS) - Kinematics, Newton's Laws, Energy, and Momentum - Students should be able to solve problems involving Kinematics, Newton's Laws, Energy, and Momentum, and know when to use which concept. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Students will be pre- and post-tested with a standardized exam from the Physics Education literature. **Assessment Method Type:** Exam - Standardized	12/15/2010 - We once again used the Mechanics Baseline Test as an evaluative instrument. As a department we saw a Hake gain of 0.45 +/- 0.11 for students who passed the class. In terms of raw data, the difference in pre-test scores between those that passed and those that failed was not statistically meaningful. However, the average raw gain for those that passed was almost double than that for those that failed. This shows that the judgement of the professors is matched by an outside evaluation. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	12/15/2010 - Progress has been made in planning an extended physics series, which would allow for more peer-interaction in the classroom. More discussion needs to take place in terms of homework policy.
		04/01/2010 - Marasco taught both sections. Using the Mechanics Baseline Test, one section had a Hake gain of 0.21+/-0.10 and the other had a gain of 0.40+/-0.19, with large error bars due to small sample sizes. While it was hard to find national averages for the MBT, the literature suggests that the average gains match the results from the FCI (average gain of 0.2). students who got Fs. The A students responded	11/16/2011 - Within the constraint of class size, the department will focus more on peer-instruction methods over lecture. Our belief is that we should offer a course sequence that spreads Physics 4A+4B over three quarters, the additional time allows for more

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
		quickly, revealed that they took manageble course loads (fewer than 20 units), for the most part did not work part-time jobs, had good math prep, and did the homework. The students who failed were slow to respond, and the only clear thing is that they did not do the homework. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	peer interaction methods. The stronger students believed that the faster homework cycle was beneficial, the weaker students don't do homework in either case.
		06/30/2009 - Cascarano's classes pre-tested with a score of 18.3 and post-tested at 22.9. Marasco post-tested only, with a score of 22.9. Cascarano's measured gain was 0.39, which well exceeds the average gain for physics lecture classes of 0.2, and compares with peer instruction gains in the 0.3 to 0.6 range. Intrument was the FCI. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2009 - Within the constraint of class size, the department will focus more on peer-instruction methods over lecture. Homework assignments will work over a shorter cycle, and more context-rich assignments will be offered. Smaller class sizes promote better peer interaction.
Department - Physics (PHYS) - PHYS 4A - GENERAL PHYSICS (CALCULUS) - Lab Experiments - Via lab experiments, students will have an understanding of the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Students will be pre- and post-tested using a standardized test from the Physics Education literature. **Assessment Method Type:** Exam - Standardized		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 4B - GENERAL PHYSICS (CALCULUS) - Topics in Electricty and Magnetism - Upon completion of the course, students hould be able to solve problems involving forces, fields and potentials created by stationary and moving charges, and basic electrical circuits. (Created By Department - Physics (PHYS))	**Assessment Method:** Students will be pre and post-tested with the Conceptual Survey in Electricity and Magnetism (TYC Physics Workshop Project). **Assessment Method Type:** Exam - Standardized	06/30/2010 - 35 students took both the pre and post CSEM assessment test Ave pre score = 14.5 out of 32 Ave post score = 24.1 out of 32 Hake gain = 0.545 National average Hake gain = 0.23 **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2010 - There was one difference this year in the way I administered the assessment test from my typical practice. Typically I give the test on the first day of instruction and again on the last day of instruction. This year I was running out of class time, so I gave the post test immediately after the final exam. I believe this showed up in the results as higher post scores than normal due to the fact that the students had studied the entire quarter's material just prior to taking the exam. Normally, on the last day of class, the students have not yet studied all the material. The exam is more of a test of what really stuck, which I like. I think that giving the test on the last day of instruction is a better way to go, both for testing true understanding and for logistics (giving the exam after the final is not usually practical). In looking at individual results it is my opinion that the students that attended regularly and made a solid effort on the in-class assignments had the best gains. That didn't always translate into higher grades. My hypothesis is that these students may not have been putting in the time outside class on the comprehensive problems (being able to combine multiple concepts in one problem) or on the more mathematically challenging problems (being able to integrate over a charge distribution to find the electric field, for example).

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			Another observation is that these every high scores came from small sections. I averaged about 24 students in one section and 19 in the other section most of the quarter. The techniques that I employ to improve conceptual understanding seem to work best with classes of this size. What I have been doing that appears to be helping, at least with the conceptual understanding: I have found several sources of worksheets that are based on physics education research and targeted at conceptual understanding (Ranking Tasks, TIPERs, Tutorials, etc.) and combined the sheets I liked the most into one textbook the students purchase. We use this book everyday in class in a peer instruction environment (attempt the worksheet yourself, turn to your neighbor and discuss it, have groups put answers on the board and discuss them, etc.). Since it appears that conceptual understanding doesn't automatically translate into higher grades, there also needs to be a focus on problem solving. Perhaps using some of the techniques we learned in our recent training class - like "player coach" (where one student watches another solve a problem and coaches them if they make a mistake or get stuck) or "pass the problem" (where the

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			first student starts the problem, the next student does the second step, etc.). The worksheets take a lot of class time. Some people need more time than others in completing the sheets prior to discussion. I plan to talk to the publisher about option for making "tear out" pages or "carbon copy" pages so I can assign pages for homework, collect them at the start of class, and then go right into discussion. That way the class time is used much more effectively. Without the ability to collect the assignment prior to discussion, I am afraid that many students will not do the homework and the class time will not be effective.
Department - Physics (PHYS) - PHYS 4B - GENERAL PHYSICS (CALCULUS) - E&M Lab Experiments - Lab experiments should teach students the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS))	**Assessment Method:** Either by review of lab reports, in-class observation, or independent study, instructors should evaluate the lab experiments on an ongoing basis. **Assessment Method Type:** Essay/Journal		
Department - Physics (PHYS) - PHYS 4C - GENERAL PHYSICS (CALCULUS) - Wave Concepts - Students should understand the following concepts about waves: 1. wave motion and energy transport by waves, 2. reflection and transmission, interference and standing waves, 3. intensity of sound and interference of	**Assessment Method:** Students will be tested twice, once in midterm, once in final in Mechanical waves. **Assessment Method Type:** Exam - Course Test/Quiz	04/01/2011 - Students understand the basic concepts introduced. Average students can apply the basic principal to similar situation. But if problem involves more than three steps, average student have trouble solving the problem. **Result:** Target Met **Year This Assessment Occurred:**	04/01/2011 - Balance lecture time and group study time. More group problem solving in class. Time. The biggest challenge is time.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
sound 4. Doppler effect (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active		2010-2011	
Department - Physics (PHYS) - PHYS 4C - GENERAL PHYSICS (CALCULUS) - Thermal Physics - Students should understand the following concepts Thermal physics: 1. Temperature, internal energy and heat transfer 2. Specific heat and Calorimetry 3. Zeroth, first, and second law of thermodynamics 4. Thermal processes and heat engines Students will articulate how thermodynamic principles affect real-world phenomena or students will be able to identify natural phenomena that are affected by heat and appraise how thermodynamic changes will affect natural systems (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** Students will be tested twice, once in midterm, once in final exam. **Assessment Method Type:** Exam - Course Test/Quiz	04/01/2011 - Students understand the basic concepts introduced. Average students can apply the basic principal to similar situation. But if problem involves more than three steps, average student have trouble solving the problem. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	04/01/2011 - Balance lecture time and group study time. More group problem solving in class. Time. The biggest challenge is time.
Department - Physics (PHYS) - PHYS 4C - GENERAL PHYSICS (CALCULUS) - Optics - Students should understand the following concepts about optics: 1. Index of refraction and Snell's law 2. Image formed by reflection and refraction 3. Thin lens and lens maker equation 4. Optical instruments 5. Interference in Young's double slit experiment and thin film	**Assessment Method:** Students will be tested twice, once in midterm, once in final in Mechanical waves. **Assessment Method Type:** Exam - Course Test/Quiz	04/01/2011 - Students seem to have more problem in these areas since this is the last portion of the quarter. There is not much time for them to fully sink in the information delivered. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	04/01/2011 - Demonstration seems to really catch students attention. Assignment is appropriate. Perhaps more problems will help student to sink in the information delivered. Course evaluation procedure works well for students. Daily quizzes

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
6. Single slit diffraction and limits of resolution (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			really push student to stay current in class, and keep up the reading.
Department - Physics (PHYS) - PHYS 4D - GENERAL PHYSICS (CALCULUS) - Einstein's Theory - Students should have both a conceptual and computational understanding of Einstein's theory of special relativity. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** A midterm will be devoted to special relativity, as well a problem on the final. Conclusions will be drawn from students' performance. **Assessment Method Type:** Exam - Course Test/Quiz	06/30/2011 - We seem to have hit a plateau on the collision problem, the better students can handle the mechanics, but many cannot. One thing I've observed is that I tell them in class to set "c" to one, and the students who have problems aren't doing this. So the ones that pay attention in class succeed. This isn't earth-shattering, but I'd like to see more students be attentive in class. Perhaps I need to whiteboard certain problems. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	11/15/2011 - Whiteboard some of the more concrete examples? I think we may run into time issues. This class didn't have nearly as much homework participation, I need to stress it more.
		06/30/2010 - Students again showed mastery of the basics. There were improvements in relativistic collisions as more time was spent on mometum-mass-energy triangles in class. This year they seemed to have problems with the paradoxes though. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2010 - Triangles worked very well. Perhaps think-check-talk should be put in place for the paradoxes. They were given a shotgun of online problems. This seemed to work well.
		06/30/2009 - While students could do basic relativity problems (length contraction, time dilation, mass), they had problems with tougher problems that involved more than two frames. Computations of relativistic collisions proved difficult. Conceptually the students were firm. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	11/15/2011 - As students have shown mastery of the basics, perhaps slightly more time on multiple-frame problems should be given. As for collisions, the energy-momentum-restmass triangle should be moved to front-and-center. Also, the use of natural units should be introduced after letting students struggle with c^2 terms.

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			An increase in the number of difficult homework problems should be made. The easy problems are a little too easy, and are perhaps needlessly repetitive.
Department - Physics (PHYS) - PHYS 4D - GENERAL PHYSICS (CALCULUS) - Schrodinger Equation - Students should have an understanding of the Schrodinger Equation and be able to solve problems with introductory-level potentials. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** A midterm will be devoted to the Schrodinger Equation, as will a problem on the final. Conclusions will be drawn from students' performance. **Assessment Method Type:** Exam - Course Test/Quiz	06/30/2010 - More or less the same results as last year, students could do standard problems such as particle-in-a-box. There seemed to be more trouble with "here's a potential, draw a wave function" type problems, but still did OK as a group. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2010 - I drew the same diagram on the board as I did the previous year, and before I could explain the bits and pieces, was asked about it by a bright student. I quickly made the point that different things were done on the same scale. What I should do is draw them out in different colors and be very clear why I am doing that.
		06/30/2009 - Students could do standard problems such as particle-in-a-box. There seemed to be more trouble with "here's a potential, draw a wave function" type problems, but still did OK as a group. **Result:** Target Met **Year This Assessment Occurred:** 2010-2011	06/30/2009 - I follow the tradition of drawing the wave function on the same graph as the potential, which is confusing to students. I need to be more explicit about what is the energy, and what is the wave function. Also, a short review of energy diagrams would probably be helpful. More graphical assignements should be given.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 4D - GENERAL PHYSICS (CALCULUS) - Lab Experiments - The lab experiments should give students deeper understanding into the historical experiments that form the basis of modern physics and the science involved. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** The lab reports from one of the experiments will be scrutinized with the goal of revising the experiment. **Assessment Method Type:** Essay/Journal	06/30/2011 - I looked at workflow this quarter. Most labs ran well, but two labs (Franck-Hertz and Electron diffraction) did not perform as well due to lack of equipment. **Result:** Target Not Met **Year This Assessment Occurred:** 2010-2011 **Resource Request:** A pair of additional electron diffraction units will cost $4000. Bringing the Franck-Hertz lab up to speed should run about $5000. These numbers are hard to justify in the current economic situation, unless the money can come from Measure E as lab e	06/30/2011 - I considered doing these labs in parallel, meaning that we would set out equipment for both labs, with half the population doing each lab, and then switching for the following week. This can be done for certain experiments, but electron diffraction needs to be done in full darkness, and Frank-Hertz in the light, so this is not an option. See resource request. **Follow-Up:** 11/15/2011 - A cheap vendor was found for Franck-Hertz, still working on electron diffraction.
		06/30/2010 - I use the pre-labs as peer-instruction. I'm now finding that each group member simply learns a very small part of the experiment. This needs to change. **Result:** Target Not Met **Year This Assessment Occurred:** 2010-2011	06/30/2010 - To make sure that each person masters the full lab, I'll have them prepare the pre-lab and tell them that I can point to any person at any time and say "switch" and the new person should be able to pick up and explain. **Follow-Up:** 11/15/2011 - The threat of a "switch" seems to have done the trick.
		06/30/2009 - I looked at the second Photoelectric Effect lab. While the students understood the concepts, they had trouble with the actual measurements. The act of determining a knee voltage visually is difficult, and many failed to reject their green LED as "bad data".	06/30/2009 - The part of the lab that requires visual judgement will be replaced by students building a circuit to test for the knee voltage. Students will also have access to wavelength vs. intensity scans that

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
		Result: Target Met **Year This Assessment Occurred:** 2010-2011 **Resource Request:** Purchase of optical lab bench equipment would be nice, but I think this prices out to $2000 a setup, an impossibility in our current economic state.	will give hints as to why student should reject the Green data point. **Follow-Up:** 11/15/2011 - In the years since, the electrical testing of the knee voltage has worked very well.
Department - Physics (PHYS) - PHYS 5A - GENERAL PHYSICS (CALCULUS) EXTENDED - Kinematics, Newton's Laws, Energy, and Momentum - Students should be able to solve problems involving Kinematics, Newton's Laws, Energy, and Momentum, and know when to use which concept. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 5A - GENERAL PHYSICS (CALCULUS) EXTENDED - Lab Experiments - Via lab experiments, students will have an understanding of the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 5B - GENERAL PHYSICS (CALCULUS) EXTENDED - Advanced Mechanics - Students should be able to apply their knowledge of mechanics to solve problems in rotations, gravity, and simple harmonic oscillators. (Created By Department - Physics (PHYS))			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 5B - GENERAL PHYSICS (CALCULUS) EXTENDED - Basic Electricity - Students shall solve problems involving electric charges, fields, and potentials and basic circuits. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 5B - GENERAL PHYSICS (CALCULUS) EXTENDED - Lab Experiments - Via lab experiments, students will have an understanding of the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 5C - GENERAL PHYSICS (CALCULUS) EXTENDED - Magnetism - Students will solve problems involving magnetic fields, currents, changing magnetic flux, electromagnetic waves and AC circuits. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 5C - GENERAL PHYSICS (CALCULUS) EXTENDED - Lab Experiments - Via lab experiments, students will have an understanding of the background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 6 - INTRODUCTORY PHYSICS - Kinematics, Newton's Laws, Energy, and Momentum - Students should understand the following basic concepts from mechanics: Kinematics, Newton's Laws, Energy, and Momentum (Created By Department -	**Assessment Method:** Students' midterm and final exam will be compared to analyze their understanding on Newton's second Law. **Assessment Method Type:** Exam - Course Test/Quiz		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings	Reflection/Action Plan & Follow-Up
Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 6 - INTRODUCTORY PHYSICS - Basic Concepts - Students should understand the following basic concepts from Electricity: Charges, electric forces and electric field. (Created By Department - Physics (PHYS)) **Assessment Cycles:** 2011-2012 **Course-Level SLO Status:** Active	**Assessment Method:** The class will be given a pre-lecture test and post lecture test within their final exam to analyze their understanding of electric charges, and electric forces. **Assessment Method Type:** Exam - Course Test/Quiz		