Introduction

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 and Math My Way are reviewed annually, 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. Dean's comments/reflection/next steps

2012-2013 Submission Deadline:

- Program review documents are due to Dean by December 14 for completion of Section 6.
- Dean completes section 6 and returns documents to program review team by January 7, 2013.
- Program review documents are due to the Office of Instruction by January 18, 2013.

Foothill College Program Review Cycle:

To see which template your department is scheduled to complete, check the Program Review Schedule: http://foothill.edu/staff/irs/programplans/2012-2013/12-13-prog-rev-schedule.pdf

Questions?

Contact: Office of Instruction and Institutional Research (650) 949-7240
Website: http://foothill.edu/staff/irs/programplans/index.php

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 members:

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

Total number of Full Time Faculty:	5
Total number of Part Time Faculty:	6

Existing Classified positions: 1
Lab Tech

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 (transcriptable). A Certificate of Achievement is state approved (transcriptable).

Section 1. Data and Trend Analysis

1.1. Program Data:

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 Programs	2010-2011	2011-2012	% Change
A.S. Degree in Physics	3	4	**33%**
A.S. Degree in Engineering	2	5	**150%**

Please provide any non-transcriptable completion data you have available. Institutional Research does not track this data.

Non-Transcriptable Program	2010-2011	2011-2012	% Change

1.2 Department Data

Physics

Dimension	2010-2011	2011-2012	% Change
Enrollment	1305	1252	-4%
Productivity (Goal: 546)	592	464	-22%
Success	76%	69%	
Full-time FTEF	1.7	2.1	27%
Part-time FTEF	4.8	4.2	-12%

Engineering

Dimension	2010-2011	2011-2012	% Change
Enrollment	225	247	10%
Productivity (Goal: 546)	359	335	-7%
Success	75%	80%	
Full-time FTEF	0.4	1.0	147%
Part-time FTEF	0.7	0.4	-39%

Department Course Data (Attach data provided by IR or manually complete chart below)

Physics

	2010-2011			2011-2012		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success
2A	296	687	79%	296	572	63%
2B	122	534	84%	107	322	81%
2C	52	706	96%	62	311	97%
4A	349	615	65%	275	470	63%
4B	179	482	76%	211	488	54%
4C	140	528	87%	124	381	84%

4D	38	534	86%	40	439	89%
6	24	360	63%	18	270	67%
12	94	1411	69%	82	1231	74%
34H	4	61	75%			
36	4	inf	100%	8	inf	100%
100	2	inf	100%	20	Inf	100%
100X	1			5	Inf	100%
100Y				4	Inf	67%

Engineering

	2010-2011			**2011-2012**		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success
10	63	383	65%	73	373	85%
35	26	390	68%	28	420	71%
36X	2	Inf	100%			
37	41	431	67%	51	383	76%
37L	19	285	95%	29	434	79%
40				30	224	76%
45	13	252	100%	20	301	84%
49	34	172	83%	16	121	93%
600	27	403	73%			

NANO

	2010-2011			**2011-2012**		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success
50	14	238	86%	13	No data	55%
51	18	270	67%	19	285	75%
52	15	225	87%	10	150	90%
53				12	180	67%
54				11	165	82%

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

1. Enrollment trends over the last two 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 enrollment over the last two years. Engineering has seen modest growth in enrollment. Both programs expect an increase in enrollment with the opening of the PSEC. Engineering expects to see growth in enrollment with the addition of Engineering Graphics as a course offering. Nanotechnology has had a

slight increase in students attending introductory courses, but a slight decrease in students. Enrollment in new programs including clean technology and sustainability are significantly influenced by the ability to build cohorts, and awareness of new course offerings. We are working with NOVA and other sustainability channel partners to attract students.

2. Completion Rates (Has the number of students completing degrees/certificates held steady, or increased or declined in the last two years? Please comment on the data and analyze the trends.
    a. AA, AS, AA-T, AS-T, Certificates of Achievement

    The number of students completing degrees has roughly stayed steady. While the percentage change seems impressive, the total number is in the range such that one or two additional or fewer students obtaining the degree will produce a large percentage change. This is similarly true of new programs including nanotechnology.

    Most of the students transfer to four-year schools and in doing so do not need the A.S. degree. The number of students that successfully complete the required courses in order to transfer is likely much higher than the A.S. degree data indicate. We do not have data on the number of students who are successfully prepared to transfer. The majority of students in the nanotechnology program already have degrees, and instead are trying to complete a four course program of study. The student makeup in clean technology is too new to analyze, however most of the students are 'non-traditional' and are attending these courses for enrichment or exploring new topics for career enhancement. This is especially true of our 'workforce' oriented students.

    b. Local, non-State approved certificates- Certificates less than 27 units: All certificates less than 27 units without state approval 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: Please analyze the productivity trends in your program and explain factors that affect your productivity, i.e. GE students, seat count/facilities/accreditation restrictions. For reference, the college productivity goal is 546.

    Productivity has gone down a small amount in both Physics and Engineering. Courses were offered at a wider variety of times, serving generally the same number of students. Productivity in nanotechnology dropped somewhat following completion of the first cohort (10) in the program, however enrollments in specialty courses has increased slightly.

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?)

    Physics 2 series maintained gains from strong growth in past years. Physics 4A enrollment returned to normal levels this past year after a year of substantial gains. Physics 4D enrollment has leveled out at a steady but low number because it is no

longer needed for acceptance at UCLA and Foothill no longer offers the course during the summer session. The Physics 100 classes were tied to the PSME center and enrollment will now be in NCBS 405.

Physics is offering a new course series, the 5 sequence. This new series will likely affect enrollment in physics overall (increase) and in the 4 series (decrease). The 5 sequence will address the issue of long completion times for students who do not do well in Phys 4A. Only 24% of students attempting 4A in the Fall successfully complete the sequence by the end of the Spring.

Engr 49 saw a decrease in enrollment. We expect that it will have better enrollment with better visibility around campus. The course can easily accommodate more students; the department met with the counselors to let them know about the course. In addition, we are making flyers about the course. Engr 45 saw a substantial increase in enrollment. This course is no longer offered at De Anza. We expect a further increase in enrollment with new state-of-the-art lab equipment being purchased this year. Engr 37 and 37L saw an increase in enrollment as De Anza did not offer the course this year.

Nanotechnology offerings saw a modest increase in enrollment in survey courses (NANO51), but that was associated with 'early summer' offerings and enrollment of high school students. Enrollment in more advanced courses including NANO52 (nanostructures) was steady while NANO53 (nanocharacterization) decreased slightly. Building high-school programs as feeders for NANO10 will increase enrollments, and outreach to incumbent worker training through IEEE and NASA for specialty courses.

a. Please comment on the data from any online course offerings.

Phys 6 is offered online. The enrollment is down a small amount from the previous year. This valuable class has some fluctuations in enrollment, yet is important to the community including local high schools. A slightly larger proportion, ~33 to 40%, of students in advanced nanotechnology courses (NANO52 and NANO53) attend the course through hybrid modality, and somewhat surprisingly have nearly identical rates of completion as well as consistency and quality of assignments.

5. Curriculum and Student Learning Outcomes (SLOs)
   a. Comment on the currency of your curriculum, i.e. are all Course Outline of Record (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?

   Yes.

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

   Recent developments in green energy should be incorporated into physics and engineering courses easily.

In addition, new developments in Physics Education Research and in Engineering Education continue to inform teaching practices and course design in both Physics and Engineering. New research suggests that feeling as though one "belongs" is a major factor in retention of Physics students. This may be a major factor for engineering students as well.

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.

Nanoscience is a constantly changing field and is challenging to keep up with across all segments (nanostructures, characterization, fabrication, etc.) however our scenario based instruction and research focused assignments attempt to keep up with current developments in the field. Use of guest speakers and tours also are used to ensure that students are exposed to the latest science and technology. Students who are also employed are encouraged to make class presentations sharing current work/research.

c. Discuss how the student learning outcomes in your courses relate to the program learning outcomes and to the college mission.

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. In both nanoscience and especially clean energy technology, the context of grand challenge problems from food, water, energy, medicine and environment help students see the importance of materials engineering in addressing unmet needs in society.

d. As a division, how do you ensure that all faculty are teaching to the COR and SLOs?

As a department, we meet at weekly department meetings to discuss content specific pedagogy. The department has also worked together to write the CORs and SLOs, so there is agreement on what the desired outcomes are for physics and engineering classes. In nanoscience the COR/SLO are integral to meeting PLO goals, especially for the NSF-ATE funded nanotechnology project. New courses ENGR 39 (Energy, Society, and the Environment) and ENGR40 (Clean Energy Technology) are both new, and have broad and somewhat overlapping SLOs. We meet as a small group to discuss the

alignment of the COR and syllabus with the overarching goals of the new courses. The program learning goals for the NSF-ATE Nanotechnology program is integrated into all courses, and both faculty teaching these courses use consistent curriculum/assessment for achieving the ATE program goals.

6. Basic Skills Programs (if applicable). For more information about the Core Mission of Basic Skills, see the Basic Skills Workgroup website: http://foothill.edu/president/basicskills.php
   a. Please discuss current outcomes or initiatives related to this core mission.
   NOT APPLICABLE

7. Transfer Programs (if applicable). For more information about the Core Mission of Transfer, see the Transfer Workgroup website: http://foothill.edu/president/transfer.php
   a. Please discuss current outcomes or initiatives related to this core mission.
   Our courses articulate to the CSUs and UCs. The courses are each geared towards preparation for transfer. We are working with both CSU/UC to develop articulation of nanotechnology and clean energy technology, with modest progress in each program.

8. Workforce/Career Technical Education Programs (if applicable). For more information about the Core Mission of Workforce, see the Workforce Workgroup website: http://foothill.edu/president/workforce.php
   a. Please discuss current outcomes or initiatives related to this core mission.
   b. Please attach minutes from your advisory board meeting(s).
   NOT APPLICABLE (ENGR) Nanoscience program development includes semi-quarterly meetings with individual advisors, such as small engineering firms, contract laboratories, and government research (NASA).

9. Student Equity: Foothill-De Anza Community College District Board policy and California state guidelines require that each California community college submit a report on the college's progress in achieving equity in five specific areas: access, course completion, ESLL and basic skills completion, degree and certificate completion, and transfer. For the latest draft of the Student Equity Report, please see the ESMP website: http://foothill.edu/staff/irs/ESMP/index.php
   a. To better inform the Student Equity efforts at Foothill College, please comment on any current outcomes or initiatives related to increasing outreach, retention and student success of underrepresented students in your program.

   The physics department has done much in terms of outreach to potential students in the local community at a variety of age-levels. The physics department puts on an annual Physics Show which attracted 5,000 people to campus last winter. Local elementary schools were invited to a free show for the first time. This year, the physics department will target schools in underserved areas for the free show.

   The physics department also holds the Physics Olympics which are likely to increase retention and student success for all students including underrepresented students. The Physics Olympics create a friendly atmosphere and are a great teambuilding

experience. Current research shows that increasing a sense of belonging leads to greater retention.

The engineering department has introduced new classes that also encourage teamwork and may help with students' feeling of belonging. Additionally, courses are being reworked to be challenging yet encouraging for all students. Research has shown that providing encouragement while challenging students leads to larger educational gains for underrepresented students while leading to gains for all students (this closes the achievement gap).

Nanotechnology courses are taught in a 'cohort' model where our goal is to make sure that the entire class achieves practical and working understanding of nanoscience and nanotechnology, and especially that everyone, independent of previous skill and experience, is able to learn to use the instruments.

Section 2. Learning Outcomes Assessment Summary

2.1. Attach 2011-2012 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.

Unit Assessment Report - Four Column

Foothill College

Program (PSME - PHYS) - Physics AS

Primary Core Mission: Transfer

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Program (PSME - PHYS) - Physics AS - Problem Solving - Upon completion of the AS degree, students will demonstrate the ability to apply the laws of physics to word problems, properly manipulating basic mathematical formulae to arrive at the correct answers. **Year PL-SLO implemented:** 2011-2012 **SLO Status:** Active	**Assessment Method:** Problems on the midterm(s) and final exam will be examined to verify that the students are properly solving physics problems. This assessment will be performed in Physics 4D. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 90% of students should meet a level satisfactory to the examiner.	07/27/2012 - While the specifics of each problem may or may not have been solved by the students, all of the students had the skills needed to apply equations and mathematics to word problems. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012	07/27/2012 - It is gratifying to see the difference between exams from the start of students' physics careers at Foothill and the end. The work is clearly at a higher level.
Program (PSME - PHYS) - Physics AS - Communication of Scientific Results - Upon completion of the AS degree, students will demonstrate the ability to effectively communicate physics by crafting written lab reports and/or giving oral presentations. **Year PL-SLO implemented:** 2011-2012 **SLO Status:** Active	**Assessment Method:** In the case of written communication, student lab reports will be evaluated against a rubric. For oral presentations, students shall deliver a mini-lecture to the class. This assessment will be performed in Physics 4D. **Assessment Method Type:** Portfolio Review **Target:** 90% of students should show mastery.	07/27/2012 - While the written lab reports were decent when evaluated by a rubric measuring "what should go in a lab report", the overall level of English was mixed. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012	07/27/2012 - Since effective written communication is a cornerstone of the modern job market, we are hurting our students by not emphasizing English skills more in lab reports. We should more strongly grade on style and delivery.
Program (PSME - PHYS) - Physics AS - Lab Skills - Upon completion of the AS degree, students will demonstrate mastery of lower-level lab skills such as proper use of standard lab equipment and proper application of data analysis. **Year PL-SLO implemented:** 2011-2012 **SLO Status:** Active	**Assessment Method:** Students will be observed in lab by the instructor for use of lab equipment, lab reports will be examined for mastery of data analysis. This assessment will be performed in Physics 4D. **Assessment Method Type:** Class/Lab Project **Target:** 90% of students should demonstrate	07/27/2012 - Students displayed strong lab skills, and were comfortable in lab. **Result:** Target Met **Year This Assessment Occurred:** 2011-2012	07/27/2012 - After 40+ hours of labs (not counting whatever they did in chemistry), our students are "at home" in labs. They do not need cookie-cutter instructions, and for the most part can proceed with minimal guidance from the instructor. They are ready to move on to the next level where they will see multi-week experiments.

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PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	mastery.		

2.2 Attach 2011-2012 Course-Level – Four Column Report for CL-SLO Assessment from TracDat

Unit Course Assessment Report - Four Column

Foothill College

Program (BSS-ACTG) - Accounting AA/CA

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings	Action & Follow-Up
Department - Accounting (ACTG) - ACTG 1A - FINANCIAL ACCOUNTING I - SLO 1 - General Theory - Explain financial accounting terminology, concepts, principles, and frameworks. (Created By Department - Accounting (ACTG)) **Assessment Cycles:** 2011-2012 2012-2013 **Course-Level SLO Status:** Active	**Assessment Method:** Per our decision from last academic year, we did away with the pre-test. We only administered a set of 30 departmental questions integrated by each instructor into their individual final exams. The 30 post-test questions were from the publisher's test bank. **Assessment Method Type:** Departmental Questions	11/17/2010 - The 30 post-test questions (from the publisher's test bank), although aligned to the chapter topics, do not appropriately align to the learning objectives. The results of the tests, we felt, do not validly measure the learning outcomes. **Result:** Target Not Met **Reporting Year:** 2010-2011 **Resource Request:** Hire knowlgeable tutors for traditional, hybrid and online courses to help students reinforce what they have learned in the classroom.	11/17/2010 - Time spent developing or adapting textbook comprehensive problems into a practice set with adjustments, working papers, Excel sheets, etc.
Department - Accounting (ACTG) - ACTG 1A - FINANCIAL ACCOUNTING I - SLO 2 - Application - Perform related calculations and demonstrate the ability to use methods and /or procedures to solve financial accounting problems. (Created By Department - Accounting (ACTG)) **Assessment Cycles:** 2011-2012 2012-2013 **Course-Level SLO Status:** Active			
Department - Accounting (ACTG) - ACTG 1B - FINANCIAL ACCOUNTING II - SLO 1 - General Theory - Explain financial accounting terminology, concepts, principles, and frameworks. (Created By Department - Accounting (ACTG)) **Assessment Cycles:** 2011-2012			

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(Nanoscience PLOs are up to date – (ontacted Darya for assistance Monday December 17th and all SLOs and PLOs are submitted correctly)

Section 2 Continued: SLO Assessment and Reflection

2.3 Please provide observations and reflection below.

2.3.a Course-Level SLO

1. What findings can be gathered from the Course Level Assessments?

The Physics and Engineering departments are accomplishing their goals using peer interaction, extra instruction time, and authentic projects. In nanoscience we have recognized a trend that suggests degree holding students are far better at completing course level goals than younger 'traditional' students, and that may impact both the level of course delivery, as well as comparative preparation of students to assimilate more complicated topics and material.

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

SEE ACTION PLANS (Nanoscience is developing a pilot program at NASA-ASL to provide JIT (Just in Time) microscopy and materials characterization skills focused on 'hands-on' learning, with supplemental online material to focus on incumbent training/workforce development. This effort will be the central focus of an NSF-TUES (Trasnforming Undergraduate Education in STEM) proposal to be submitted in May 2013 (NASA/ASL (UCSC) and Foothill College)

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

The CL-SLOs reflect not only the knowledge, skills, and abilities needed to succeed in the course sequence but also the knowledge, skills, and abilities needed to succeed in the programs that students will transfer to. This is especially true in the engineering courses as they cover a variety of content areas that do not directly build on one another. Nanoscience is reworking some course level SLOs and emphasizing more practical hand-ons instrument skills in PLOs, and especially selection of techniques for materials analysis and engineering.

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

The department has become more aware of areas in which student learning gains can be improved. The results of SLO assessments have been discussed in our weekly department meetings along with discussions of underlying causes and potential solutions. 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. Nanoscience is continuing to reflect on the disparity in success and quality of assignments between degree holding and traditional students.

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

2.3.b Program-Level SLO

1. What summative findings can be gathered from the Program Level Assessments?
At the end of the physics sequence, students are able to solve problems and discuss their findings in writing. Students can successfully approach a problem and use physics and math concepts to solve the problem. Students also have a good understanding of experimental techniques.

At the end of the engineering program, students are prepared for transfer to an engineering program at a 4-year university. Students have teamwork skills, technical communication skills, and analytical problem solving skills.

At the end of nanoscience survey course students reflect on applications of nanotechnology in addressing grand challenge problems, and approaches to effective engineering programs. In advanced nano courses (characterization and fabrication), students present approaches to solving specific problems, including tools, techniques, and outlines for experimental study.

2. How has assessment of program-level student learning outcomes led to certificate/degree program improvements?
The physics and engineering departments have begun an ongoing conversation about desired outcomes for students and discussions about what skills and knowledge are most important

and useful in the students' coursework and careers. Program Learning Outcomes in nanotechnology focus on workplace competencies, which has driven us to develop a workforce (incumbent worker) oriented training program with UCSC at NASA-Ames.

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

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 Previous Program Goals from last academic year

Goal	Original Timeline	Actions Taken	Status/Modifications
1 Support Physics 5 Sequence Introduction	2012-2013	In Progress	The Physics 5 sequence is being introduced.
2 Updating Engineering 10 and 49 Courses	2011-2012	Completed	Engr 10 and Engr 49 have been updated, although adjustments will be ongoing.
3 Developing and Updating Engineering courses to broaden the courses offered at Foothill	2011-2013	In Progress	Engr 10 and Engr 49 have been updated. Engr 6 and Engr 45 are in the process of being updated.
4 Improving technology use in peer-instruction	2012-2013	Beginning Conversation on Topic	Will go further with adoption of laptops and tablets in PSEC.

classes			
5 Lab support	2012-2013	Ongoing	Labs need ongoing maintenance.

3.2 New Goals: Goals can be multi-year (in Section 4 you will detail resources needed)

Goal	Timeline (long/short-term)	How will this goal improve student success or respond to other key college initiatives	Action Steps
1. develop more effective recruitment of nano students	Short and medium	Reach students with better preparation for more complex topics	Develop new methods of outreach beyond IEEE, AVS, Foresight, etc.
2. Develop effective outreach for building workforce participation in ENGR 40 (clean energy)	Short and long term	We need larger cohorts to understand motivation of students and what their goals are. How can ENGR40 help get them reemployed?	Work with NOVA and WIB/WIA to develop course content and activities that help place students in productive work and/or internships
3. Develop awareness for new GE course ENGR39 (Energy Society and the Environment)	Short and long term	Need to develop effective cohorts to get students aware of the new GE course and increase interest in sustainability (ENGR)	Work with college/campus marketing and internal methods (division email / newsletter)

Section 4: Program Resources and Support

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

Full Time Faculty and/or Staff Positions

Position	$ Amount	Related Goal from Table in section 3.2 and/or rationale

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

Position	$ Amount	Related Goal from Table in section 3.2 and/or rationale

One-time B Budget Augmentation

Description	$ Amount	Related Goal from Table in section 3.2 and/or rationale
Send a spreadsheet to Peter		

Ongoing B Budget Augmentation

B Budget FOAP	$ Amount	Related Goal from Table in section 3.2 and/or rationale
Ongoing for Engr 10, 39, 40 and 45 from lottery	$4,000	Student use in class

Facilities and Equipment

Facilities/Equipment Description	$ Amount	Related Goal from Table in section 3.2 and/or rationale

Section 5: Program Strengths/Opportunities for Improvement

5.1 Address the concerns or recommendations that were made in prior program review cycles.
Concern 1: student success in physics. We are introducing the Physics 5 sequence that should help improve the success rate for students who are less well prepared when they enter the series.

Concern 3: professional development for both full-time and part-time faculty in technology, standards for student success, and teaching techniques. We are holding weekly department meetings where we discuss these things. These meetings are currently attended by full-time faculty but can easily be expanded to include part-time faculty as well. Providing coffee and pastries for these meetings may incentivize attendance.

Concern 4: faculty are spread thin creating innovative curriculum, developing external relationships, developing and writing proposals, and working grants. Concern 5: new course development by adjuncts is sustained by external funding. Concern 6: create campus STEM

research projects for students in combination with internships at 4 year colleges. Reassign time would provide time to develop new courses and programs.

5.2 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?
NONE

5.3 After reviewing the data, what strengths or positive trends would you like to highlight about your program?
Overall, the Physics and Engineering departments are continuing to improve the level of instruction, reach out to more students, and expand the programs. Nanotechnology has completed the first cohort in the sequence of four courses, has developing NANO10 for articulation with UC, and is developing a workforce centric training program at NASA-Ames. High schools and their science faculty are interested in working partnerships with Foothill co-developing curriculum, and becoming part of our 'Science Learning Networks'.

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 Sarah Parikh 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, sustainability as well as energy. The cross-disciplinary nature of physics-engineering-nano permits faculty to address new curriculum from a broad manner.
8. Development of a two cross disciplinary courses with Biology. One is a course in Bioengineering. The second is on Sustainability called Cooking the Earth.
9. Offering a Phys 2A and 2B online series for HS students at the Da Vinci School.
10. Developed a PHYS 5A/B/C series to offer the PHYS 4A/B at a slower pace. This had a false start in 2012-13 and number of contact hours reduced starting in summer 13.
11. The Physics-Engineering Club has been focused on Quad and Octo Rotor platforms.
12. An AS in Sustainability is under development for 2013-14
13. They are the lead group for the SLI STEM Summer camp for underrepresented HS students.

6.2 Areas of concern, if any:

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 math pedagogy, and develop completely new math 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, K-12 Common Core Standards and use of external materials from MOOCs.
4. Identifying Part-Time Faculty who can develop new course materials for the engineering courses. 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 undergraduate (UG) research projects for students, in combination with internships at 4 year colleges in the area.
6. Students who want to pursue particular knowledge, such as nanostructures, characterization, and/or fabrication, we have not been successful in getting traction for sequence completion by 'traditional' students who are exploring new topics in science. Thus the program still has a boutique appeal. We are exploring new methods of delivery to address that.
7. In our initial offering of ENGR40 (Clean energy Technology) we were able to build a 20 student cohort from NOVA WIB (local workforce component of a larger federal training grant) but have not had success in building subsequent cohorts. Without an effective workforce training component (stream of students) there is a concern that enrollments from the traditional Foothill College pool may not be adequate to sustain this course.
8. We are just beginning to get new sustainability courses (ENGR39 Energy Society and the Environment) into the GE curriculum. We need to build those enrollments quickly to ensure program and course viability. These are good courses (ENGR39 and ENGR40) and provide excellent introductions to knowledge about energy technology, sustainable engineering, and the need to develop effective solutions to these critical problems.
9. Engr 37 and 37L CORs are obsolete and need to be updated.

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. This was not well advertised by Counseling and had too many contact hours. Need to work with Counseling and include in DegreeWorks.
   b. Identify a list of math skills assessment and remediation. Frank Cascarano offered workshops in 12F. This will be expanded in 13W and 13Sp.
   c. The Physics 2 series requires a FT faculty to review and revamp the sequence & labs. David Marasco and Frank Cascarano taught the 2 series in 12F.
2. 6.2.1 Student Outside Demands:
   a. Provide precollegiate math students financial "support package". SLI will start funding in 13Sp.
   b. Develop special contracts based on course success and levels of participation in their classes and tie to STEMway.
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. 6.2.2, 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. This will be funded from SLI Foundation.
   b. Use external funds such as grants and Foundation funds when possible to fund both FT & PT faculty.
5. 6.2.3 Professional Development:
   a. Invite pedagogy "experts" for lectures or 1 quarter visiting professor to act as coach / mentor
   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

Upon completion of section 6, the Program Review should be returned to department faculty and staff for review, then submitted to Instruction and Institutional Research for public posting. See timeline on page 1.

Unit Course Assessment Report - Four Column

Foothill College

Mission Statement: A well-educated population being essential to sustaining and enhancing a democratic society, Foothill College commits itself to providing access to outstanding educational opportunities for all of our students. Whether through basic skills, career preparation, lifelong learning, or transfer, the members of the Foothill College community are dedicated to the achievement of learning and to the success of our students. We affirm that our unwavering dedication to this mission is critical to the prosperity of our community, our state, our nation, and the global community to which all people are members.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	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)) **Course-Level SLO Status:** Active	**Assessment Method:** Documentation from the design project **Assessment Method Type:** Class/Lab Project **Target:** 75% of the class will receive a B or better on the design project documentation.	02/10/2012 - 85% of the students who turned in the project documentation received a B or better on the assignment. **Result:** Target Met **Reporting Year:** 2011-2012	02/10/2012 - While the students who remained engaged in the class through the end of the quarter performed well in terms of demonstrating their problem solving skills, some students attended only a handful of classes before not continuing to attend class. Documentation is a large part of this course and the students made huge gains in terms of the quality of their work as the course progressed.
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Engineering Commuication - Communicate effectively through written documents and oral presentations (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Active	**Assessment Method:** Oral presentation to the class on the design project. **Assessment Method Type:** Presentation/Performance **Target:** 90% of the class shows improvement in oral communication skills between the first and last oral presentations.	02/10/2012 - There was great improvement in the presentation skills of the students who participated in the two presentations. A few students, who presented at the first presentation with a very high level of communication success, did not show improvement because their presentations remained at a high level. The percentage of students showing improvement is estimated at 90%. **Result:** Target Met **Reporting Year:** 2011-2012	02/10/2012 - Because some students come into class with a very high level of skill in oral communication, we should consider rewriting the SLO to be more broad.
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING -	**Assessment Method:** Peer survey. Survey completed by team	02/10/2012 - 90% of the students present at the end of the course were rated "Satisfactory" or	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Engineering Process - Work as a contributing member of a functional team (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Active	members at the end of the project. **Assessment Method Type:** Survey **Target:** 80% of the class being rated as "Satisfactory" or better by their team members.	better by their team members. Students who were non-participatory by the end of the course were not included in this assessment. **Result:** Target Met **Reporting Year:** 2011-2012	02/10/2012 - Tension runs high at the end of the course. In order to better gauge how well students contribute to a team, I will consider changing the assessment method to be an average of all of the surveys that are given.
Department - Engineering (ENGR) - ENGR 10 - INTRODUCTION TO ENGINEERING - Application of Knowledge - An ability to apply knowledge of mathematics, science and engineering. (Created By Department - Engineering (ENGR)) **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)) **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 102 - BUILDING SCIENCE & PERFORMANCE ENGINEERING - Energy efficiency measures - Articulate to key building stakeholders' current building energy use, appropriate energy efficiency measures, and the potential for energy and economic savings (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
End Date: 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 102 - BUILDING SCIENCE & PERFORMANCE ENGINEERING - Energy auditing techniques - Perform energy auditing techniques, energy use analysis, including benchmarking, in the commissioning or renovation of new and existing buildings (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 102 - BUILDING SCIENCE & PERFORMANCE ENGINEERING - Upgrade and replace HVAC, lighting and glazing - Develop engineering approaches and economic strategies for upgrading or replacing HVAC, lighting, glazing, applying pertinent energy codes and building standards (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 102 - BUILDING SCIENCE & PERFORMANCE ENGINEERING - Analyze and apply onsite PV (BIPV) - Analyze the economics of on-site photovoltaic and other alternate energy systems (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 102 - BUILDING SCIENCE & PERFORMANCE ENGINEERING - Zero			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Net Energy Buildings - Use modeling tools to diagram potential approaches to zero net energy buildings (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Inactive			
Department - Engineering (ENGR) - ENGR 25 - FRESH WATER PROCESS - basic calculations - Be able to do basic calculations related to water quantity, flow, and energy generation from hydropower (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 25 - FRESH WATER PROCESS - policy on water - Have greater insight into how water policy is made and implemented (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 25 - FRESH WATER PROCESS - water sector - Be introduced to cost, financing, and rate-making challenges in the water sector (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 25 - FRESH WATER PROCESS - problem solving - Have practice breaking a complex water problem into important parts, studying			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
the parts, and then reconnecting the parts to better understand the entire problem (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 25 - FRESH WATER PROCESS - water issues - Be knowledgeable about important water issues in California and beyond (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 28 - AN INTRODUCTION TO BIOENGINEERING - Career Paths - The student will be able to describe the bioengineering industry and identify the available career opportunities (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 28 - AN INTRODUCTION TO BIOENGINEERING - Biology Foundation - The student will be able to define and describe the fundamentals of molecular biology as they pertain to bioengineering including, but not limited to, nucleic acid and protein structure, the human genome, and cell biology. (Created By Department - Engineering (ENGR))			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Assessment Cycles: End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 28 - AN INTRODUCTION TO BIOENGINEERING - Design Process - The student will be able to list and describe the steps of the bioengineering design process. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 28 - AN INTRODUCTION TO BIOENGINEERING - Physical Systems Foundation - The student will be able to analyze the physical processes associated with common biological systems and emonstrate how conservation laws (including conservation of mass and energy, momentum, and charge) apply to biological and medical systems. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 28 - AN INTRODUCTION TO BIOENGINEERING - Instrumentation - The student will be able to recognize and compare current imaging and microscopy instrumentation. (Created By Department - Engineering (ENGR))			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Assessment Cycles: End of Quarter **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 28 - AN INTRODUCTION TO BIOENGINEERING - Applications - The student will be able to recognize and discuss current applications of bioengineering to medicine, agriculture, and technology. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active			
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)) **Course-Level SLO Status:** Active	**Assessment Method:** Final exam **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 70% students can use principle of equilibrium to analyze particles and rigid bodies correctly.	05/22/2012 - 85% students completed equilibrium of 3-dimentional rigid body correctly. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** none	05/22/2012 - 3-dimentional equilibrium of a particle or rigid body is challenging. It takes repetition for student to get it eventually. I found that having students repeat the material over and over really helped student to gain some insight about equilibrium.
		05/22/2012 - 85% students complete this problem correctly. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** none **GE/IL-SLO Reflection:** 3-dimensional equilibrium of a particle or rigid body is challenging for student at the first. It takes repetition for students eventually get the idea. This strategy seems	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		working, and it will be used again.	
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 SLO Status:** Active	**Assessment Method:** End of quarter project **Assessment Method Type:** Class/Lab Project **Target:** 90% of students should apply structure analysis to their end of quarter project by building bridge structure that take specified load.	05/22/2012 - 83% students successfully completed truss analysis, and 100% of students who made the final project demonstrated their understanding on truss and frames by making their a bridge undertake more more load than the required minimum. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** Small fund to help students pay for their bridge material.	05/22/2012 - Having students build bridge using strews and put their knowledge into test is very efficient way to evaluate their understanding and give them hand-on experience. It's also fun.
Department - Engineering (ENGR) - ENGR 36 - SPECIAL PROJECTS IN ENGINEERING & TECHNOLOGY - E36-Special project - Students should be able to demonstrate improved hands-on skill in carrying out their project. (Created By Department - Engineering (ENGR))	**Assessment Method:** evaluate final project **Assessment Method Type:** Observation/Critique		
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)) **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 37 - INTRODUCTION TO CIRCUIT ANALYSIS - Quantities of DC and AC Circuits - Students will correctly calculate			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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)) **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 schematic diagrams, and perform simple problem-isolation techniques on laboratory circuits. (Created By Department - Engineering (ENGR)) **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 37L - CIRCUIT ANALYSIS LABORATORY - Circuit Analysis Laboratory - The student will be able to: a) make satisfactory measurements in circuits containing dc, ac and composite signals using equipment commonly found in an electrical engineering laboratory. b) understand the effect of a measuring instrument on a circuit under test. analyze resulting error. (Created By Department - Engineering (ENGR)) **Start Date:** 04/09/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Supervise students' work in lab session and monitor students' progress using equipment and making correct measurement. **Assessment Method Type:** Observation/Critique **Target:** By end of the quarter, 100% of students should be able to know how to use equipment and how to correctly making related measurement.		

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Engineering (ENGR) - ENGR 39 - ENERGY, SOCIETY, & THE ENVIRONMENT - Global Energy Situation - Learn about our global energy situation and relevant economic and environmental issues (Created By Department - Engineering (ENGR)) **Start Date:** 10/01/2012 **End Date:** 12/01/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 39 - ENERGY, SOCIETY, & THE ENVIRONMENT - Clean energy technology - Understand clean energy technology, and policies and actions to accelerate positive change (Created By Department - Engineering (ENGR)) **Start Date:** 10/01/2012 **End Date:** 12/31/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 39 - ENERGY, SOCIETY, & THE ENVIRONMENT - Measure and analyze energy use - Learn how to measure and analyze energy use in buildings, transportation, and apply tools and other behavioral changes to achieve goals in personal energy use and GHG emissions (Created By Department - Engineering (ENGR)) **Start Date:** 10/01/2012 **End Date:** 12/31/2012 **Course-Level SLO Status:** Active			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Engineering (ENGR) - ENGR 40 - INTRODUCTION TO CLEAN ENERGY TECHNOLOGY - Understand Modern Energy Systems - Students will develop a qualitative and quantitative understanding of modern energy systems, how energy technology has evolved over the last 150 years, and how it meets the needs of residential, commercial, industrial, and transportation. (Created By Department - Engineering (ENGR)) **Start Date:** 10/01/2011 **End Date:** 12/31/2011 **Course-Level SLO Status:** Active	**Assessment Method:** Through weekly questions students will show evidence of understanding of each topic, including descriptions of technology, numerical use of energy data, diagrams of energy technology, and use of figures to help explain energy concepts. **Assessment Method Type:** Departmental Questions **Target:** The majority of students will show sufficient mastery of a topic to explain core ideas and concepts to peers, and use calculations, diagrams, etc. as a method of demonstrating engineering skills for each topic. Some weekly questions will build on previous work in the course, demonstrating cummulative learning about energy.	02/15/2012 - Students did very well with this assignment if they stayed up with the reading, and worked dilligently on the homework. **Result:** Target Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** Some students were a bit overwhelmed with the assignments, as they had not spent enugh time reading, refelcting on teh lectures, and working in groups to prepare notes for the assignment. Over teh quarter, most students eventually mastered the discipline requied to stay up with teh assignments.	
Department - Engineering (ENGR) - ENGR 40 - INTRODUCTION TO CLEAN ENERGY TECHNOLOGY - Understand economic - energy - environmental connection (IPAT) - Students will develop a quantitative understanding of the connection (correlation) between population, income, energy use, and environmental impact (IPAT). Students will apply IPAT by global/region, level of economic development, and extrapolate to 2030, and understand the imperitive for developing clean energy technology (Created By Department - Engineering (ENGR)) **Start Date:** 10/01/2011 **End Date:** 12/31/2011 **Course-Level SLO Status:** Active	**Assessment Method:** This is a midterm assignment where students will use a combination of the first SLO, understanding of modern energy systems, with IPAT, which combines knowledge of how economies are built on energy, and how economic growth leads to increased consumption through energy intensive activities. A key assessment finding is projection of economic growth through 2030, and how fossil fuels driving that growth will lead to unacceptable levels of greenhouse gas emissions. **Assessment Method Type:** Research Paper **Target:** Compete assignments will show good numerical models for GHG emissions, tied to each sector of energy use, and regionally by economic development. The majority of students will leave with a profound understanding of our dependence on fossil fuels, and a quantitative idea about how	02/15/2012 - Students struggled with this, but over half had a fairly good understanding of the relationship between energy, economic growth, consumption, and environmental impact of energy use. However, most did not understand the rate at which clean energy technology needs to be adopted to avoid unaccpetable levels of GHG **Result:** Target Not Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** This assignment needs some structured handholding, including handouts that walk students trough specific examples of energy and GHG emissions for electricity, buildings, transportation etc., and perhaps showing scenarios where we did or did not meet 2030 targets for GHG emissions (specifically staying under 450 ppm)	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	much clean energy technology needs to be developed by 2030.		
Department - Engineering (ENGR) - ENGR 40 - INTRODUCTION TO CLEAN ENERGY TECHNOLOGY - Application of Clean Energy Technology - Students will learn about clean energy technology for energy generation, distribution, commerce, industry, buildings, and transportation, and apply a specific technology to applications in each of these energy applications (Created By Department - Engineering (ENGR)) **Start Date:** 10/01/2011 **End Date:** 12/31/2011 **Course-Level SLO Status:** Active	**Assessment Method:** Through a combination of a class lab project with an accompaning research paper, students will apply a number of clean energy technologies to a specific application of energy use, such as energy generation, distribution, buildings, transportation, using compelling engineering descriptions in text, using calculations, diagrams and figures, and persuasive oral presentation. **Assessment Method Type:** Class/Lab Project **Target:** The majority of students will find good applications of clean energy for needs in commerce, industry, buildings, and transportation.	02/15/2012 - The majority of students easily found an application fo clean energy technology that they could articulate a compelling story, indlcuing detail of teh technology, how it worked, and why it was important. **Result:** Target Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** Students struggled with this initially, as it was a final assignment and procrastination led them to delay starting the assignment, but they genuinly enjoyed this assignment, and were very prouf of what they had accomplished.	
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)) **Course-Level SLO Status:** Active	**Assessment Method:** Students performance will be scored by answering questions on the final exam. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 80% of the students taking the exam getting a B or better.	10/01/2012 - 81.25% of the students completing the final exam scored a B or better. One student began the final exam but was unable to complete it during the exam time and was excluded from the analysis. **Result:** Target Met **Reporting Year:** 2011-2012	10/01/2012 - This SLO seems appropriate and a good measure of student success. It should be kept for the next time the course is taught.
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 Method:** Students will be assessed by their average performance on laboratory projects for the quarter. **Assessment Method Type:** Class/Lab Project **Target:** 70% of the class scoring a B or better will be considered success.	10/01/2012 - 83% of the students receiving grades for the course scored an average of a B or better on the laboratory projects. **Result:** Target Met **Reporting Year:** 2011-2012	10/01/2012 - This SLO should probably be rewritten. It is a little vague, and the assessment method is not well aligned with the desired outcome.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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)) **Course-Level SLO Status:** Active	**Assessment Method:** 7-10 page essay on engineering career plan. **Assessment Method Type:** Essay/Journal **Target:** 85% of students receive a grade of B or better.	02/24/2012 - All of the students taking the course received a B or better on the essay assignment. **Result:** Target Met **Reporting Year:** 2011-2012	02/24/2012 - While the target seems to have been easily met this quarter, I think that the SLO and the assessment method are both on target for what we hope students will gain from the course. I will not be making changes to the SLO or assessment method for next year.
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)) **Course-Level SLO Status:** Active	**Assessment Method:** Class discussion on ethical issues and responsibilities in engineering. **Assessment Method Type:** Discussion/Participation **Target:** 75% of the class contributing to the discussion.	02/24/2012 - For the discussion on ethics, 100% of the class happened to be in attendance that day (which is pretty lucky). Each student participated in the discussion, although some students needed to be encouraged to speak. **Result:** Target Met **Reporting Year:** 2011-2012	02/24/2012 - Because some students may by absent on the day of the discussion, this SLO should maybe be rewritten to make sure that absent students have thought about engineering ethics as well.
Department - Engineering (ENGR) - ENGR 54H - HONORS INSTITUTE SEMINAR IN ENGINEERING - Technical Communication - Students should be able to discuss the importance of their topic and explain the details of their topic in written form. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Academic Year **Course-Level SLO Status:** Active	**Assessment Method:** Each student should turn in a research paper at the culmination of the course. **Assessment Method Type:** Research Paper **Target:** 75% of students should achieve an A on the research paper.		
Department - Engineering (ENGR) - ENGR 54H - HONORS INSTITUTE SEMINAR IN ENGINEERING - Independent Analysis -	**Assessment Method:** Students will discuss with the instructor their interests and plans for pursuing the topic of		

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Students should be able to demonstrate initiative in pursuing and analyzing the topic of interest. (Created By Department - Engineering (ENGR)) **Assessment Cycles:** End of Academic Year **Course-Level SLO Status:** Active	choice. **Assessment Method Type:** Discussion/Participation **Target:** By the end of course, 100% of students demonstrate through discussions their interest and plans for research.		
Department - Engineering (ENGR) - ENGR 6 - ENGINEERING GRAPHICS - Sketching by hand - Students will be able to sketch orthographic drawings according to industry standards from a given object. (Created By Department - Engineering (ENGR))	**Assessment Method:** Assignment to sketch an orthographic drawing from an object. **Assessment Method Type:** Class/Lab Project		
Department - Engineering (ENGR) - ENGR 6 - ENGINEERING GRAPHICS - Computer Aided Design models - Students will be able to create 3-D models using CAD software that adhere to standards in design and manufacturing. (Created By Department - Engineering (ENGR))	**Assessment Method:** Assignment to create a 3D model of an object following industry standards for design and manufacturing. **Assessment Method Type:** Class/Lab Project		
Department - Engineering (ENGR) - ENGR 81 - ELECTRIC POWER SYSTEMS - Modern power systems - Describe and diagram a modern electric utility system, infrastructure, and power systems architecture (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 81 - ELECTRIC POWER SYSTEMS - Electrical concepts and measurements - Apply physics of electricity and magnetism to calculate, predict and safely measure basic			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
properties of power systems. (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 81 - ELECTRIC POWER SYSTEMS - Distributed generation and smart energy systems - Apply power systems knowledge to distributed generation, active distribution, and smart energy management (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 82 - PHOTO VOLTAIC & SOLAR CELL DESIGN - Science of Photo Voltaics - Understand the basic science of solar photovoltaic technology and the primary technologies currently available (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 82 - PHOTO VOLTAIC & SOLAR CELL DESIGN - Solar installation process - Understand how to assess, design, and construct a solar installation from fabrication to grid incorporation (Created By Department - Engineering (ENGR))			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Start Date: 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 82 - PHOTO VOLTAIC & SOLAR CELL DESIGN - Drivers and limitations of solar PV adoption - Be able to discuss the political, environmental, and economic motivations and limitations of solar energy use (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 83 - SMART ENERGY SYSTEMS - Modernized Grid - Articulate the need for a modernized grid with a ?smart energy? intelligence layer (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			
Department - Engineering (ENGR) - ENGR 83 - SMART ENERGY SYSTEMS - Smart energy architecture - Describe and diagram the physical and logical architecture of smart energy systems (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Course-Level SLO Status: Active Department - Engineering (ENGR) - ENGR 83 - SMART ENERGY SYSTEMS - Smart energy process - Describe and articulate the relations of stakeholders and smart energy process (Created By Department - Engineering (ENGR)) **Start Date:** 04/01/2012 **End Date:** 06/30/2012 **Course-Level SLO Status:** Active			

Unit Course Assessment Report - Four Column

Foothill College

Mission Statement: A well-educated population being essential to sustaining and enhancing a democratic society, Foothill College commits itself to providing access to outstanding educational opportunities for all of our students. Whether through basic skills, career preparation, lifelong learning, or transfer, the members of the Foothill College community are dedicated to the achievement of learning and to the success of our students. We affirm that our unwavering dedication to this mission is critical to the prosperity of our community, our state, our nation, and the global community to which all people are members.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	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)) **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)) **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)) **Course-Level SLO Status:** Active			
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))			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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)) **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)) **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)) **Start Date:** 12/01/2010 **End Date:** 06/30/2011 **Course-Level SLO Status:** Active	**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:** Survey **Target:** The majority of students in the class report that the class met the objectives which they had set.	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 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	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		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 **Reporting Year:** 2010-2011	
Department - Physics (PHYS) - PHYS 12 - INTRODUCTION TO MODERN PHYSICS - Understanding Relativity - Students will demonstrate an understanding of how Einstein's theories of relativity changed our understanding (through measurables) of space, time, and mass. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	**Assessment Method:** Exam questions on both the quizzes and exams in Physics 12 will probe students' understanding of the ideas of relativity and ask students to apply this understanding to new situations. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Students should be able to answer a majority of these questions successfully (keeping in mind, however, that these are tricky concepts, and even the best students may not get all questions right.)	09/18/2012 - Throughout this evening course, taken by a very wide range of students (wide in ability, background, previous exposure, maturity, time to study, etc.), I try to use visuals and analogies to give them a deeper understanding of the two theories of relativity. I have been developing questions on quizzes and exams that carefully probe this understanding, not just directly, but by asking students to apply what they have learned to new situations. I have examined the results of that subset the assessment quizzes and exams that apply to ideas from relativity. The majority of students were in fact able to demonstrate a good understanding of the key ideas in the course in answering these questions. (As expected, students who did not attend regularly were less able to do this, confirming the importance of all that I do in the class to encourage and require regular attendance.) **Result:** Target Met **Reporting Year:** 2011-2012	
Department - Physics (PHYS) - PHYS 27 - COOKING THE EARTH - Critical Thinking – Cause and Effect - Students should be able to demonstrate their understanding of the relationship between greenhouse gasses and climate change. Students should be able to demonstrate their understanding of the relationship between climate change effects	**Assessment Method:** This SLO will be assessed by either an in class exam question(s) or an assignment. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 75% of students demonstrate their understanding through mastery of the		

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
(changes in temperature, etc.) and ecosystems. (Created By Department - Physics (PHYS)) **Assessment Cycles:** End of Academic Year **Course-Level SLO Status:** Active	assignment by earning a B or better.		
Department - Physics (PHYS) - PHYS 27 - COOKING THE EARTH - Computation – Graph Reading - Students should be able to demonstrate their ability to interpret scientific data from a graph and understand the meaning of the data. (Created By Department - Physics (PHYS)) **Assessment Cycles:** End of Academic Year **Course-Level SLO Status:** Active	**Assessment Method:** This SLO will be assessed by either an in class exam question(s) or an assignment. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 75% of students demonstrate their ability to interpret and understand scientific data through earning a B or better on the assessment.		
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 **Target:** The class should show an improvement of 0.2 as measured by a normalized gain. This is the national average for physics courses.	07/02/2012 - This course was pre and post-tested with the MBT. We found that in a small sample size we observed a gain of 0.21, while a second section with a larger sample size found a gain of 0.11. The wide range of student ability combined with not large sample sizes leads to large error bars on these measurements. **Result:** Target Not Met **Reporting Year:** 2011-2012 **Resource Request:** Full-timers need to spend more time in the 2 sequence. **GE/IL-SLO Reflection:** The Mechanics Baseline Test requires that students solve basic physics problems, this test requires the skills found in both the Computation and Creative, Critical and Analytical Thinking GE Outcomes. There was a wide range of student performance on this test, and we feel that this suggests	07/02/2012 - One of the measured sections hit target (although this was a small sample size). The other was below target, we believe this is due to the fact that this instructor was transitioning from the 4 sequence to the 2 sequence, and was not able to use as much peer-interaction as in the past (due to one fewer teaching hours per week). Instructor is more comfortable with the time constraints and has plans (eg Khan Academy videos) for distributing instruction to make better use of the in-class hours.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		that the full-timers should spend more time thinking about how to teach this GE class.	
		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 **Reporting Year:** 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 reponsibility 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 **Reporting Year:** 2010-2011	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 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 **Target:** Instructors should be satisfied that	07/02/2012 - The department feels that having the pendulum lab last defeats the purpose of a inquiry lab as the students have covered far too much of the topic in lecture, and have too strong a background for discovery. **Result:** Target Met	07/02/2012 - This can be addressed by simply moving the inquiry lab a week earlier. This benefits the students in two ways, not only does it solve the original problem, but it also gives students another week's

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	implementation of lab revision will lead to improved student understanding in lab. These improvements should also reflect current best practices in pedagogy.	**Reporting Year:** 2011-2012 **Resource Request:** None	worth of gravity, which is helpful to the prior lab which requires a strong understanding of the relationship between orbits and energy.
Department - Physics (PHYS) - PHYS 2AM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Derivatives in Mechanics - The student will be able to apply derivatives to problems in kinematics, dynamics, energy, momentum and related topics (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 2AM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Integrals in Mechanics - The student will be able to apply integrals to problems in kinematics, dynamics, energy, momentum and related topics. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 2AM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Simple Second-order Differential Equations - The student will be able to solve introductory second-order differential equations. (Created By Department - Physics (PHYS))			
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	**Assessment Method:** Students will be pre- and post-tested using a standardized exam. **Assessment Method Type:** Exam - Standardized **Target:**	09/17/2012 - We pre and post-tested, realizing a gain of 0.23, within range of the national average. **Result:** Target Met **Reporting Year:** 2011-2012	09/17/2012 - While we met expectations, the peer-interaction model can lead to even stronger gains. Resources in the form of paid student helpers would lead to

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
simple circuits. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	The class should show an improvement of 0.2 as measured by a normalized gain. This is the national average for physics courses.		stronger student achievement.
		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 **Reporting Year:** 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 - 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)) **Course-Level SLO Status:** Active	**Assessment Method:** Students will be pre- and post-tested with a standardized exam. **Target:** The class should show an improvement of 0.2 as measured by a normalized gain. This is the national average for physics courses.	09/17/2012 - We pre and post-tested, realizing a gain of 0.23, within range of the national average. **Result:** Target Met **Reporting Year:** 2011-2012	
		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	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.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		Reporting Year: 2010-2011	
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)) **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	07/11/2012 - The lab we chose to examine is one where students examine Ohm's Law. We've found that while the 4B (calculus series) does Ohm's Law in one week, the 2B (algebra/trig) sequence benefits from splitting this lab over two weeks. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** None specific, although budget should be allocated for normal wear-and-tear on electronic labs.	07/11/2012 - With more time, perhaps more activities should be placed into this lab. Currently (no pun intended) in the 4B series we have the instructors choose to investigate the non-ohmic behavior of the lightbulb or the internal resistance of a power supply. Spread over two weeks, the 2B students could do both.
Department - Physics (PHYS) - PHYS 2BM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Electric Fields via Calculus - The student will be able to apply the methods of calculus to calculate electric fields and potentials from charge distributions. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 2BM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Gauss's Law and Ampere's Law - The student will be able to apply the methods of calculus to calculate electric and magnetic fields for the appropriate symmetric distributions. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Physics (PHYS) - PHYS 2BM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Faraday's Law and Corrected Ampere's Law - The student will be able to apply the methods of calculus to solve for the electric/magnetic fields generated from changing electric/magnetic fields. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 2BM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Time Behavior of RC, LR, RL and LRC circuits - The student will be able to apply the methods of calculus to solve problems in circuits with time-varying behavior. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			
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)) **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 **Reporting Year:** 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 - Optics - Students should demonstrate competence in optics,	**Assessment Method:** At least one question on the midterm and final shall cover the topics in this SLO. The	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	06/30/2011 - The students did poorly for two reasons, the fact that the test did not give them access to

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
including: Relection Refraction Lenses Mirrors (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	instructor will evauluate students' performance. **Assessment Method Type:** Exam - Course Test/Quiz	improvement. This can be attributed to two factors, as seen in the reflections. **Result:** Target Met **Reporting Year:** 2010-2011	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)) **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 **Reporting Year:** 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)) **Course-Level SLO Status:** Active	**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	07/11/2012 - The lab we examined was the radioactivity lab. This was deemed to be a strong lab, with students learning about a topic they will need to understand as citizens. There are marginal improvements that could be made. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** Yearly purchases need to be made to replenish isotopes with short half-lives.	07/11/2012 - The radioactivity lab is much improved, mainly due to the purchase of new Geiger counters several years ago. This has made setup and measurement much easier for the students, allowing them to concentrate on the physics. They can look at a variety of different radioactive sources, and learn the difference between alpha, beta and gamma rays. Due to the nature of these labs, we do need to

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
			make yearly purchases of elements that have short half-lives. We should explore if chemistry or math (exponential decay) can make use of shared resources.
Department - Physics (PHYS) - PHYS 2CM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Thermodynamics - The student will be able to solve problems in Thermodynamics involving calculus. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active			
Department - Physics (PHYS) - PHYS 2CM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Optics - The student will be able to interpret phenomena in Waves and Optics with a calculus treatment. (Created By Department - Physics (PHYS))			
Department - Physics (PHYS) - PHYS 2CM - GENERAL PHYSICS - CALCULUS SUPPLEMENT - Modern Physics - The student will be able to solve problems in Modern Physics involving calculus. (Created By Department - Physics (PHYS))			
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)) **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:**	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.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		Target Met **Reporting Year:** 2010-2011	
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)) **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)) **Course-Level SLO Status:** Active	**Assessment Method:** Performance at the Physics Show **Assessment Method Type:** Observation/Critique **Target:** Students perform well at the Physics Show	09/18/2012 - Students were given several topics from their introductory physics classes to explain to an audience of elementary school children. Our students explained the physics while performing memorable demonstrations of the topics. Learning outcomes for our students include: improved understanding of the physics topics; preparing science explanations and teaching them to young people; building confidence by making their oral presentation in front of large groups of people; developing / fostering a joy of teaching. This program is a real "win-win" for the community and our students. It has been a great success and we plan to continue offering this opportunity to our students. **Result:** Target Met **Reporting Year:** 2011-2012	
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 Method:** Observation of Physics Show performance. **Assessment Method Type:** Observation/Critique **Target:** Students perform well at the Physics Show.	09/18/2012 - Students were given several topics from their introductory physics classes to explain to an audience of elementary school children. Our students explained the physics while performing memorable demonstrations of the topics. Learning outcomes for our students include:	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Course-Level SLO Status: Active		improved understanding of the physics topics; preparing science explanations and teaching them to young people; building confidence by making their oral presentation in front of large groups of people; developing / fostering a joy of teaching. This program is a real "win-win" for the community and our students. It has been a great success and we plan to continue offering this opportunity to our students. **Result:** Target Met **Reporting Year:** 2011-2012	
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)) **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)) **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 SLO Status:** Active			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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)) **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)) **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 **Target:** The class should show an improvement of 0.2 as measured by a normalized gain. This is the national average for physics courses.	07/02/2012 - The measured section showed a gain of 0.21, exceeding both the national average and the stated target. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** Funding for in-class peer interaction aids. **GE/IL-SLO Reflection:** The Mechanics Baseline Test requires that students solve basic physics problems, this test requires the skills found in both the Computation and Creative, Critical and Analytical Thinking GE Outcomes. The student gains on this test exceeded the national average, and the department is satisfied with the results.	07/11/2012 - While the target was met, a gain of 0.21 is lower than we've seen for classes taught with more peer instruction. Our experience has been that with greater interactive time, more gain by the students. With class sizes growing, money for instructional support in the form of hired helpers may be beneficial.
		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 **Reporting Year:** 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.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		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 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 **Reporting Year:** 2010-2011	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 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 **Reporting Year:** 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	**Assessment Method:** Instructors will examine a lab for major revision/improvement. **Assessment Method Type:**	07/10/2012 - In general, instructors were satisfied with the labs. However, wear and tear does cause attrition on our equipment. With smaller classes, if	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
background science, error analysis, and how to perform experiments. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	Class/Lab Project **Target:** Instructors should be satisfied that implementation of lab revision will lead to improved student understanding in lab. These improvements should also reflect current best practices in pedagogy.	we are missing one or two setups, the issue is not noticed, but as we are running closer to capacity (class size limits actually mean that students sometimes work in lab groups of greater than two), it is more important that we have full class sets plus spares for our lab equipment. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** Funding for repair/replacement of instructional lab equipment.	
		07/02/2012 - The ballistic pendulum lab suffers from equipment that is hard for students to use. The "bullet" often bounces off of the target, and much instructor time is spent simply getting the experiment to work **Result:** Target Not Met **Reporting Year:** 2011-2012 **Resource Request:** $10K for new ballistic pendula.	07/10/2012 - A part-time instructor suggests that the equipment from PASCO is superior. These units can be found at http://www.pasco.com/prodCatalog/ME/ME-6830_ballistic-pendulum/index.cfm at a cost of roughly $800 prior to taxes and shipping. A class set of 12 could be purchased for $10k, and would serve both 2A and 4A labs. 07/02/2012 - This can be addressed by simply moving the inquiry lab a week earlier. This benefits the students in two ways, not only does it solve the original problem, but it also gives students another week's worth of gravity, which is helpful to the prior lab which requires a strong understanding of the relationship between orbits and energy.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
GENERAL PHYSICS (CALCULUS) - Topics in Electricty and Magnetism - Upon completion of the course, students should 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 **Target:** The class should show an improvement of 0.2 as measured by a normalized gain. This is the national average for physics courses.	01/23/2013 - In the Fall of 2012 we pre and post-tested with the CSEM, as planned. We found that out of 32, the mean score was 13, and post-test the mean was 19.5. This represents a Hake gain of 0.34, well above the national average. While this score is good, it is down from our previous results, which took place in much smaller classes, where peer interaction was easier. **Result:** Target Met **Reporting Year:** 2012-2013 **Resource Request:** PD resources for instructors	01/23/2013 - The department views the high gain to be due to strong peer-interaction pedagogy. Our department has been fortunate to have faculty who are willing to learn new skills such as peer interaction in order to support student success. We would like funds to either attend more professional events or to bring in outside experts to help us.
		07/02/2012 - Students were pre-and-post tested using a national standardized test. Their average pre-test scores were 13 and post 24.3 for a gain of 0.59 (+/-0.42). This shows strong improvement by these students. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** Given the success of peer-interaction as a teaching method in physics, money to hire students to assist in the peer interaction model would lead to improved student success.	07/02/2012 - This class uses a peer instruction workbook (a compilation of available materials put together by the instructor and purchased by the students) every lecture. This material is also included on exams to stress the importance to the students. The students take the activities seriously and the results validate the methodology.
		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 **Reporting Year:** 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

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
			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). 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

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
			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 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

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
			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	07/10/2012 - This year we looked at the build-a-motor lab. We found that students had problems with this lab because the act of creating good windings is very time consuming and difficult, and does not lead to better understanding of motors. **Result:** Target Not Met **Reporting Year:** 2011-2012 **Resource Request:** A small amount (<$2K) for purchase of student motors.	07/10/2012 - We should look into purchase of better equipment. One option is PASCO's student motor: http://www.pasco.com/prodCatalog/SE/SE-8658_permanent-magnet-motor/ A class set could be purchased for less than $1500 before taxes and shipping. More investigation into options should be made before purchase.
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 sound 4. Doppler effect (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	**Assessment Method:** Students will be tested twice, once in midterm, once in final in Mechanical waves. **Assessment Method Type:** Exam - Course Test/Quiz	04/20/2012 - Students this quarter seem to have good grasp of wave concept. Wave question on Final exam, 70% get 9 and above out of 10. 74% passed question. 25% failed to realize how the concept is applied in real life. Majority of the students showed their good understanding in concept: 61 % of the students got over 90% right, and 26% got over 80% correct, only 13% got 60% correct. **Result:** Target Met **Reporting Year:** 2011-2012	
		04/01/2011 - Students understand the basic concepts introduced. Average students can apply	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		the basic principal to similar situation. But if problem involves more than three steps, average student have trouble solving the problem. **Result:** Target Met **Reporting Year:** 2010-2011	04/20/2012 - Students this quarter seem to have good grasp of wave concept. Wave question on Final exam, 70% get 9 and above out of 10. 74% passed question. 25% failed to realize how the concept is applied in real life. Majority of the students showed their good understanding in concept: 61 % of the students got over 90% right, and 26% got over 80% correct, only 13% got 60% correct. 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) - 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	**Assessment Method:** Students will be tested twice, once in midterm, once in final exam. **Assessment Method Type:** Exam - Course Test/Quiz	04/20/2012 - Students have good grasp of energy, work in thermodynamics. 87% of the students answered this part of the question correctly. But they seem to have trouble to understand abstract ideas like entropy. Only 60% seems to get it. **Result:** Target Not Met **Reporting Year:** 2011-2012	
		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.	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 & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
affect natural systems (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active		**Result:** Target Met **Reporting Year:** 2010-2011	
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 6. Single slit diffraction and limits of resolution (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	**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 **Reporting Year:** 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 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)) **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 **Target:** At least 80% of the students should be able to solve simple problems such as length contraction or time dilation, and 80% should be able to solve paradoxes at the level of the Twin Paradox.	07/27/2012 - This year's students showed strong understanding of relativity, exceeding the targets for assessment. **Result:** Target Met **Reporting Year:** 2011-2012	07/27/2012 - Physics 4D was taught by a part-timer this year, due to Professor Marasco's PDL. The part-timer spent three weeks on relativity, rather than the typical two. It is unclear if this luxury can be afforded as a permanent change.
		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.	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.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		Result: Target Met **Reporting Year:** 2010-2011	
		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 **Reporting Year:** 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 **Reporting Year:** 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. 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	**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.	07/27/2012 - Students had strong understanding of Schrodinger's equation in both the wave and matrix form. **Result:** Target Met	07/27/2012 - The part-timer spent a good deal of time on these concepts, at the expense of time on the hydrogen atom. In this case the

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
introductory-level potentials. (Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active	**Assessment Method Type:** Exam - Course Test/Quiz	**Reporting Year:** 2011-2012	basics were probably over-emphasized, although more advanced material was certainly both covered and mastered by the students.
		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 **Reporting Year:** 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 **Reporting Year:** 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.
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.	**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	07/01/2012 - This year we looked at the electron diffraction lab. Students showed a strong understanding of wave-particle duality, which is at the heart of quantum mechanics. The combination of real and virtual equipment provided a nice balance to the lab. One of the diffraction	07/01/2012 - The findings point to both solid instruction in lecture, and a well-designed lab. Outside of purchase of replacement parts, no action needs to be taken directly

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
(Created By Department - Physics (PHYS)) **Course-Level SLO Status:** Active		globes seems to be going, and if there are funds, should be replaced. Also, many students did not suppress the zeroes when appropriate on their graphs, and that finding needs to be propagated through the department. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** If possible, a new electron diffraction globe should be purchased.	related to this lab. Physics faculty should discuss grading of graphs in lab reports as an item in a future department meeting.
		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 **Reporting Year:** 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 **Reporting Year:** 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:**

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
			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". **Result:** Target Met **Reporting Year:** 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.	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 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))			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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))			
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			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 - Physics (PHYS)) **Course-Level SLO Status:** Active	**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		
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)) **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		