A. ASSESSMENT OF INTERNAL AND EXTERNAL FACTORS AND STUDENT SUCCESS: Perform a SWOT analysis of your program, indicating the STRENGTHS, WEAKNESSES, OPPORTUNITIES, and THREATS in relation to program goals and available resources, including an evaluation of the curriculum in terms of student needs. Analyze the external factors affecting program goals and performance, e.g., changes in demographic, educational, social, economic, workforce, or global trends; evolving technology; demand (based on enrollment trends or other factors); linkage with other related campus programs, services, or committees; local availability of similar programs; availability of auxiliary funding. Include supplemental survey results and other data whenever available. (References: Educational Master Plan; Curriculum Sheet; Department and All-College Program Review Data (Retention, Success); 1999-2000 Program Planning Summary; Other ________)

1. Internal Factors
   
   **Curriculum**
   
   **Strengths:**
   1) Transferable and degree-applicable courses which satisfy the requirements for majors in any discipline.
   2) Courses which satisfy the General Education Laboratory Science requirement for students with various levels of mathematical ability.
   3) Academic prerequisites appropriate to the expected background necessary for success in the courses.

   **Weaknesses:**
   1) Lack of English language proficiency prerequisites.
   2) Lack of a registration procedure which guarantees the completion of prerequisites prior to enrollment.
   3) Lack of a registration procedure which guarantees the co-enrollment or completion of co-prerequisite courses prior to enrollment.
   4) Lack of uniform grading practice guidelines for instructors.
   5) Lack of uniform study time guidelines to assist students in forming realistic expectations about their time allocations.

   **Other**
   
   **Strengths:**
   1) One fully qualified faculty instructor solid and current knowledge of the field.
   2) High rate of transferring to prestigious schools

   **Weaknesses:**
   1) Failure to replace two retired full-time physics faculty members. The fraction of physics load carried by part-time faculty during the current academic year is (F-2002), % (W-2003), and % (S-2003).
   2) Failure to replace the full-time laboratory technician.
   3) Insufficient number of computers in the laboratories for performing microcomputer-based laboratory experiments. There are currently only 9 computers serving both laboratory rooms.
   4) Obsolete printers which breakdown frequently during experiments.
   5) Insufficient quantities of equipment for some experiments
   6) Outdated and obsolete equipment for some experiments.
   7) Insufficient budget to remedy items 3), 4), 5), or 6).
   8) Lack of dedicated laboratory space. Laboratory equipment cannot be left assembled, since rooms are used for both laboratories and lectures by several instructors. Without lab technician the amount of assembling and disassembling are substantial.
   9) Rooms 5502 and 5503 are poorly designed for multi-media presentations.

2. External Factors
   
   1) Substantial population of students with deficient skills in English.
   2) Substantial population of students with deficient skill in math.
   3) Lack of time commitment to studying physics on a substantial number of students.
3. **Opportunity**
   1) Re-organized lab technician with sufficient computer skills to maintain technology oriented equipment.
   2) Third laboratory room in current renovation plan dedicated to each physics discipline (mechanics, electromagnetism, thermal/modern physics).
   3) New simulation software to augment laboratory experiments.

B. **STUDENT SUCCESS EVALUATION:** Briefly discuss how the program is performing relative to program and college projections for student success. Comment on specific student success programs or services provided by the college that you perceive to be particularly valuable to your students. Identify unmet needs related to student success. *(References: Educational Master Plan; Curriculum Sheet; Department and All-College Program Review Data (Success); 1999-2000 Program Planning Summary; Other________)*

Overall at Foothill student success rates in physics courses is 80%. This is about the same as the college average for all other courses.

C. **STUDENT EQUITY/DIVERSITY ANALYSIS:** Student equity may already be defined as a factor in the above assessments. Use this section to offer additional observations and to specify other needs related to bringing your program into alignment with college or program goals for student equity. *(References: Educational Master Plan; Division and All-College Program Review Data (Success by Ethnicity, Gender, Age); Other________)*

Three groups of students perform at a level above the campus average in physics courses. Asians, white, and unrecorded students do best at 84 percent and 82 percent success rates. Success rates for Pacific Islander (71%), Native American (0%), African American (63%), and Hispanic/Latino (66%) are below the averages for other groups of students in physics.

Enrollment in physics courses by ethnicity is not proportional to the all college composition. Asians are substantially over represented (50%) while whites are greatly under represented (18%) compared to the campus population.

Students of both genders and all ethnicities are welcomed and treated equally. The discipline of physics is inherently both gender and ethnically neutral. Recognition of limited ability in English is made in the form of extra time allotments on exams, a willingness to explain unfamiliar non-technical words, and/or approval to use a foreign dictionary.

D. **ACTION PLANS AND PROPOSED PROGRAMMATIC CHANGES:** Review the Education Master Plan (EMP), Partnership for Excellence (PFE) goals, Curriculum Sheet, and Department Program Review Data. Using measurable terms, describe the program's goals related to these documents. *(Examples: “The number of students issued a Career Certificate will increase by five over last year's figure.” “The program will initiate an advisory board.” “Faculty will examine learning goals for their programs and courses.” Etc.)*

1. **Program Goals Related to Educational Master Plan and Partnership for Excellence:**
   - Continue the development of physics courses to support physics, engineering, chemistry, biology, earth science, and all other majors.

2. **Other Program Improvement Plans:**
   1) Hire two additional full-time physics faculty members.
   2) Hire a full-time lab technician.
   3) Re-activate Introduction Physics course to non-science major students.
   4) Restore the third physics laboratory room to make three dedicated rooms for different subjects in physics (Mechanics, Electricity & Magnetism, Thermal/optics/modern physics)
   5) Upgrade obsolete printers in Rooms 5406 and 5407.
   6) Continue to request equipments needed to complete numerically deficient sets and to replace un-repairable or obsolete items.
   7) Establish English language proficiency prerequisites.
8) Establish study time guidelines for physics course.
9) Establish uniform grading practice guidelines.

E. ENROLLMENT AND PRODUCTIVITY GOALS  (References: Program Review Data Sheet (Enrollment and Productivity); Other_________)

The State economy will have an increasing influence on physics enrollment and productivity. As long as unemployment remains high in Santa Clara county demand for traditional courses, such as physics, will remain high. CSU displaced students potentially will increase demand as well. Program growth has been dramatic from year 2000-2001 (675) to 2001-2002 (1032). It was 50% increase. However, the State budget response may have the effect of reducing our ability to serve potentially increasing demand, as insufficient growth funding, reduced PFE funding, and reduced general funds will serve to reduce Foothills ability to respond to the increased demand. If resources and facilities are available to meet the demand the department could sustain a further growth.

Productivity (WSCH/FTE) in physics has average 575 over the last three years with a range of 540 to 635. This is well above the campus average of 551 in the same time frame and above the district goal of 530.

F. SUMMARY OF RESOURCES REQUESTED: Summarize resources needed to reach program goals and describe the expected outcomes for program improvement. (Specifically what will be the outcome of receiving these resources? What will happen if the resource requests aren't granted?) Complete any of the following sections that apply to your current program needs.

1. FULL-TIME EQUIVALENT FACULTY OR STAFF NEEDS:
   The percent of instructional hours offered by full-time faculty averages around 25 percent measured by assignment type. This percentage dropped from 49 percent to 23 percent for the years 2001-02 and 2002-03 after one full-time faculty retired. Assuming no growth and the same mix of F-T : P-T course offerings, ______ additional FTEF will be required to reach the 75 : 25 target ratio.

   Hiring two more full-time instructors is very urgent. In this laboratory science program it is very difficult to coordinate laboratory activities with part-time faculty. Full-time faculty members can work together as a team to develop and implement the new computer based laboratory experiments. They can also establish the guideline for consistent grading.

   It is equally important to have a full-time lab technician to support the growing enrollment in physics courses. With 12 lab sections day and night, it is impossible to operate without lab technician to set out equipments needed for each section and store them away once the labs are done. More importantly with broken parts or malfunctioning equipment, it is impossible to keep all the equipment in operating status to ensure the daily instruction.

2. FACILITIES NEEDS: (Include all aspects of the physical setting, e.g., room size, seating type and arrangement, multimedia equipment, lab stations, etc., that might provide a more effective student learning environment.)

   a) With growing enrollment the department needs additional laboratory room to accommodate the need to host more lab sections and accommodate specialized equipments for different subject.
   b) DVD players in Rooms 5501, 5502, 5503, 5506, and 5507.
   c) Light needs to be controlled separately in all the rooms so the front room can be dark while the audience part of the room remains illuminated.
   d) All rooms should be multi-media ready and have Internet connection.
   e) The facility needs for Rooms 5406 and 5407

<table>
<thead>
<tr>
<th>Lecturer Accommodations</th>
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<tbody>
<tr>
<td>Screens</td>
<td>Two (2) at front</td>
</tr>
<tr>
<td><strong>Multimedia</strong></td>
<td>Upgraded computer with DVD player and Internet connection. Video camera and VCR interfaced to computer display also desirable.</td>
</tr>
<tr>
<td><strong>Writing Boards</strong></td>
<td>Two (2) wall whiteboards as current design permits</td>
</tr>
<tr>
<td>Utilities</td>
<td>Electricity - standard 110. Gas, air, hot/cold water required at lecturer table</td>
</tr>
<tr>
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<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Variable Lighting (Room)</td>
<td>Make more accommodating to darkening front while lighting audience</td>
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**Storage**

| Cabinets | Continuation on single wall desired. Cabinets above current cabinets desired for additional storage |

**Lab for Electromagnetism/Thermodynamics**

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<tr>
<td><strong>Number</strong></td>
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<tr>
<td><strong>Workbenches</strong></td>
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<td><strong>Equipment</strong></td>
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<tr>
<td><strong>Utilities</strong></td>
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<tr>
<td><strong>Design</strong></td>
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</tbody>
</table>

**Lecturer Accommodations**

| Screens | Two (2) at front |
| Multimedia | Upgraded computer with DVD player and Internet connection. Video camera and VCR interfaced to computer display also desirable. |
| Writing Boards | Two (2) wall whiteboards as current design permits |
| Utilities | Electricity - standard 110. Gas, air, hot/cold water required at lecturer table. Additional hot/cold water facilities needed on side board. |
| Variable Lighting (Room) | Make more accommodating to darkening front while lighting audience |

**Storage**

| Cabinets | Continuation on single wall desired. Cabinets above current cabinets desired for additional storage |

**Lab for Modern Physics/Thermodynamics**

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<tr>
<td><strong>Utilities</strong></td>
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</tbody>
</table>
Cabinet storage for PASCO interfaces is required. Traditional and computerized experiments must be supported. The desirability of a flat workspace, support for computer operations, and workbench storage for computers is under consideration by the design team. The ability to remove and/or otherwise store the computer display for safety reasons is also under consideration.

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3. MATERIALS AND SUPPLIES BUDGET AUGMENTATION:

Augment the physics budget to put additional software in the lab. Also, two printers in the labs are past their useful life and need to be replaced. The two instructor computers are obsolete and unable to perform updated program. Some experiments urgently need more sets to fulfill the growing number of students we serve in each lab section.

Evaluation of academic year 2003-04. Date of evaluation:

List names of participants assisting in this program review.

Primary program contact person: Xiujuan Wang
Phone or email address: Ext. 7493, wangsue@foothill.edu
Full-time faculty: Xiujuan Wang
Part-time faculty: Gary Latshaw, Charles Jordon, and Nancy Seemen
Administrators: Angel Sierra, Chuck Lindauer
Classified staff: Students:
PROGRAM NAME: Physics  
Degree/certificate options available: A.S. Degree in Physics

PROGRAM MISSION: The Physics department has three basic missions: successful transfer of engineering and science majors to four year institutes, provide a variety of courses to satisfy general education requirements, and provide educational support for vocational educational programs.

EXPECTED STUDENT OUTCOMES: 1) Depending upon the field of study, graduates from the transfer program will have studied a variety of physics fundamentals of mechanics, electromagnetism, thermal physics, optics, and modern physics in preparation for further study in the client disciplines.
2) The goals for general education are to provide students with some basic physics knowledge to fulfill the requirement of general science course with laboratory work. An example of such course is PHYS 10.
3) Vocational support is provided mainly through courses in PHYS 12 and 6, therefore the students will be able to take science related vocational discipline.

| INTENDED OR DIRECT OUTCOMES: Program-Specific Outcomes and Attributes Desired of Program Graduates |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| **PROGRAM CONTENT PROFICIENCIES/COMPETENCIES** | **DESIRED ATTRIBUTES:** What should a student be able to do upon graduation? | **REQUIRED PROGRAM COURSES** related to this outcome: Where do students acquire experience? | **OUTCOME MEASURES** — Evidence or Sample Demonstrating Deep Learning: How do we know what a student has achieved? |
| Knowledge of principles of physics in the mechanics aspect. | Demonstrate an understanding of mathematics-physics interrelationships and Newtonian mechanics including inertia, laws of motion, momentum and gravitation. Identify a problem in a new situation and apply their knowledge to unfamiliar situations. | PHYS 4A, 2A, 10, 60 | Direct Measures  
1. Students will perform homework, collaborative projects, laboratories, and take a variety of testing instruments including weekly quizzes, midterms and a comprehensive Final Exam.  
2. Successful completion of the proficiencies/competencies is indicated by a grade of C or better in all courses listed. |
| Knowledge of how the electricity and magnetism work | Demonstrate an understanding of mathematics-physics interrelationships and electricity, magnetism including circuit, electrostatics, induction and electromagnetic waves. Identify a problem in a new situation and apply their knowledge to unfamiliar situations. | PHYS 4B, 2B, 10, 60 | Direct Measures  
1. Students will perform homework, collaborative projects, laboratories, and take a variety of testing instruments including weekly quizzes, midterms and a comprehensive Final Exam.  
2. Successful completion of the proficiencies/competencies is indicated by a grade of C or better in all courses listed. |
| Knowledge of physical concepts – thermal physics | Demonstrate an understanding of thermal phenomena, including hear, heat transfer, kinetic theory of gases, laws of thermodynamics. Identify a problem in a new situation and apply their knowledge to unfamiliar situations. | PHYS 4C, 2C, 10, 60 | Direct Measures  
1. Students will perform homework, collaborative projects, laboratories, and take a variety of testing instruments including weekly quizzes, midterms and a comprehensive Final Exam.  
2. Successful completion of the proficiencies/competencies is indicated by a grade of C or better in all courses listed. |
| Knowledge of physical concepts – optics | Demonstrate an understanding of optical phenomena, including dual nature of light, geometric optics (lenses, instruments) and physical | PHYS 4A, 2A, 10 | Direct Measures  
1. Students will perform homework, collaborative projects, laboratories, and take a variety of testing instruments including weekly quizzes, midterms and a comprehensive Final Exam.  
2. Successful completion of the proficiencies/competencies is indicated by a grade of C or better in all courses listed. |
| Knowledge of physical concepts – modern physics | Demonstrate an understanding of modern development in physics, including special relativity, statistical mechanics, quantum mechanics, atoms, nucleus, and elementary particles. Identify a problem in a new situation and apply their knowledge to unfamiliar situations. | PHYS 4D, 2C, 12 | Direct Measures 1. Students will perform homework, collaborative projects, laboratories, and take a variety of testing instruments including weekly quizzes, midterms and a comprehensive Final Exam. 2. Successful completion of the proficiencies/competencies is indicated by a grade of C or better in all courses listed. |
| CORE COMPETENCIES | CORE COMPETENCIES: Outcomes and Attributes Distinct to This Program | Students will receive a C or better in all courses listed. | Students will receive a C or better in all courses listed. | Students will receive a C or better in all courses listed. |

| Understanding | • Demonstrate understanding all the core physics principles and concepts | PHYS 2A, 2B, 2C PHYS 4A, 4B, 4C, 4D PHYS 10, 12, 60 | Students will receive a C or better in all courses listed. |
| Computation | • Express mathematical representation of physics principles. • Derive special formulas from general principles, • Use appropriate technology to perform problem-solving tasks. • Break a complex problem into multiple parts and employ any combination of deductive, inductive, or symbolic reasoning to solve the problem. • Use appropriate technology to perform problem-solving tasks. • Use quantitative reasoning to decide if an answer is reasonable. | PHYS 2A, 2B, 2C PHYS 4A, 4B, 4C, 4D PHYS 60 | Students will receive a C or better in all courses listed. |
| Application | • Develop a curiosity about how the material learned in the course can be applied in new ways. • Apply existing knowledge to what was learned previously to successfully complete more advanced coursework; learn how to learn mathematics. • Synthesize a new realization from separately learned facts over one or more courses to make conjectures about how this realization applies to existing concepts or when considering new relationships. • Recognize limitations of physics laws and make predictions about phenomena in the real world | PHYS 2A, 2B, 2C PHYS 4A, 4B, 4C, 4D PHYS 10, 60 | Students will receive a C or better in all courses listed. |

**Communication**

Creative, Critical & Analytical Thinking

Community/Global Consciousness & Responsibility