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.

   **Weakness:**
   1) Lack of dedicated laboratory lab space for engineering program.
   2) Lack of software in support to engineering course including Graphics (AutoCAD) and Circuits (Electronic Bench).

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

   **Weakness:**
   1) Lack of access to adequate computer lab for Auto CAD, and Circuit design.
   2) Lack of classified support.
   3) Lack of accurate counseling.
   4) Lack of qualified tutorial support.
   5) Insufficient budget to remedy items 3), 4), 5), or 6).

2. **External Factors**
   1) An increasing population of students with deficient skills in math.
   2) Rapidly changing computer technology and equipment obsolescence.
   3) University engineering schools are reducing lower division engineering required courses, thus reducing the demand for our engineering courses.
   4) Decreasing federal support for physics research and decreasing job opportunities in physics research.
   5) No college budget specifically for engineering.
   6) Unpredictable state funding

3. **Opportunity**
   1) Re-organized lab technician with sufficient computer skills to provide classified support.
   2) Allocate computer labs for engineering courses.
   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. \textit{(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 82%. This is about the same as the college average for all other courses.

C. \textbf{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. \textit{(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 (54%) while whites are greatly under represented (10%) compared to the campus population.

Students of both genders and all ethnicities are welcomed and treated equally. In the discipline of engineering women are traditionally underrepresented (24% in 2001-2002). 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. \textbf{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. \textbf{Program Goals Related to Educational Master Plan and Partnership for Excellence:}
   Continue the development of engineering courses to attract engineering students and therefore greater enrollment in math, physics, chemistry, biology, earth science, and some other majors.

2. \textbf{Other Program Improvement Plans:}
   1) Re-evaluate Introduction to Engineering Profession course to make it 2 units credit course and therefore cover more material to make the introduction more thorough.
   2) Allocate laboratory rooms to engineering program.
   3) Upgrade computer software to support engineering curriculum.

E. \textbf{ENROLLMENT AND PRODUCTIVITY GOALS} \textit{(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 engineering courses will not suffer too badly as the CSU and UC has limited their enrollment. Program growth has been dramatic from year 2000-2001(39) to 2001-2002 (72). It was 85\% 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.

Productivity (WSCH/FTE) in physics has average 322 over the last three years with a range of 184 to 395. This is below the campus average of 551 in the same time frame and below the district goal of 530.

F. \textbf{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 100 percent measured by assignment type. This percentage dropped from 100 percent to 33% percent for the years 2001-02 and 2002-03 after one full-time faculty assumed more physics course responsibilities.

   Hiring a full-time lab technician in physics to support the growing demand in lab work and computer need.

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.)

   1) 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.
   2) All rooms should be multi-media ready and have Internet connection.
   3) The facility needs for labs accommodating engineering courses: computer stations for:
      a) Room for Graphics Design: Drafting table, Screen, multi-media projection system, computer stations with AutoCAD software.
      b) Room for Circuit analysis: Screen, multi-media projection, and computer stations with circuit design software, benches to host various electronic equipment, shelves to store electronic parts.
      c) Room for Statics: Screen, multi-media projection system.

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.

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**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:

Administrators: **Angel Sierra, Chuck Lindauer**

Classified staff:

Students:
PROGRAM NAME: Engineering  
Degree/certificate options available: A.S. Degree in Engineering

PROGRAM MISSION: The Engineering department has one basic mission: successful transfer of engineering and science majors to four year institutes.

EXPECTED STUDENT OUTCOMES: Depending upon the field of study, graduates from the transfer program will have studied a variety of entry level of engineering discipline including introduction to engineering profession, engineering mechanics in statics, electric circuits, applies descriptive geometry, and engineering graphics in preparation for further study in the client disciplines.

<table>
<thead>
<tr>
<th>INTENDED OR DIRECT OUTCOMES: Program-Specific Outcomes and Attributes Desired of Program Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROGRAM CONTENT PROFICIENCIES/ COMPETENCIES</strong></td>
</tr>
<tr>
<td>Knowledge of what engineers do.</td>
</tr>
<tr>
<td>Knowledge of electric circuit and design</td>
</tr>
<tr>
<td>Knowledge of equilibrium in engineering mechanical design</td>
</tr>
<tr>
<td>Knowledge of engineering graphics and design</td>
</tr>
</tbody>
</table>
## 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?

### Core Competencies:

#### Understanding
- Demonstrate understanding all the core engineering principles and concepts.
- ENGR 50, 35, 37, 37L, 6
- 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.
- ENGR 50, 35, 37, 37L, 6
- 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.
- ENGR 50, 35, 37, 37L, 6
- Students will receive a C or better in all courses listed.

#### Communication

- Creative, Critical & Analytical Thinking
- Community/ Global Consciousness & Responsibility