COMPREHENSIVE PROGRAM REVIEW

2004-2005

PHYSICAL SCIENCES: ASTRONOMY, CHEMISTRY, ENGINEERING, PHYSICS

(WITH SUMMARY OF GEOLOGY AND OCEANOGRAPHY)

Physical Sciences Fulltime Faculty:

- Professor John H. Preston, Astronomy
- Dr. Jeanette Medina, Chemistry
- Dr. Amelito Enriquez, Engineering
- Dr. Martin D. Partlan, Physics

Dean Victoria O'Donnell

PHYSICAL SCIENCES: ASTRONOMY, CHEMISTRY, ENGINEERING, PHYSICS

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY
(2 page maximum)

Short Summary of Findings

Type your summary here:

The Physical Sciences at Cañada College consist of the following departments: Astronomy, Chemistry, Engineering, Geology, Oceanography and Physics. Included in this report are program reviews for Astronomy, Chemistry, Engineering, and Physics along with a brief summary of the courses offered in Geology and Oceanography. All four departments are experiencing growth; since Fall of 2002, the Physical Sciences Departments have nearly doubled enrollment in their courses. The faculty in these departments have conscientiously and constructively improved course offerings and enhanced student enrollments and they receive strong support from the Science and Technology Division's Math, Engineering, and Science Achievement (MESA) program and from the Learning Center. These programs also have strong support from the related fields of mathematics and computer science so that students with different levels of academic preparation can be admitted and be successful.

Astronomy is a small department offering only 3 classes but these classes serve a relatively large number of Cañada students and have consistently high enrollments and high success rates. Astronomy is often the first science course that students take and we hope that our courses instill in them a desire to find out more about the world around them by taking other science courses whose ideas and methods are first encountered in astronomy.

The Chemistry Department has experienced a variety of changes in a short period of time. The number of courses we offer has increased to five in the Fall semester and six in the Spring semester. There are several courses that we offer once a year. Student enrollments, retention and successes have all improved. Factors which have stimulated growth in the Chemistry Department, which are discussed in detail in Chemistry's report, include our partnership with San Francisco State University for the Bachelor in Science-Nursing Program, the introduction of Organic Chemistry courses and the strong commitment of all the members of the Chemistry Department to students' success.

The faculty in the Engineering Department emphasizes the importance of an active and interactive learning environment, collaborative work among students, and project-based labs. There is also a strong focus on the use of computer technology to enhance learning and improve student success. Cañada's engineering program has been able to respond to dramatic changes in engineering and technological fields and to keep the curriculum current in alignment with four-year institution in order to ensure transfer success. As with the other physical science departments, engineering's enrollment has increased considerably over the last five years as a result of the department's successful recruitment, modernization of computer labs, the hiring of full-time faculty in Chemistry and Physics and success at securing external funding through grants to support the program.

The Physics Department successfully prepares students for transfer to universities and to provide the foundation for careers in engineering and other sciences. The Physics Department continues to experience enhanced student enrollment and improvement in retention and student success.

Each program has outlined their strengths and suggestions for improvement, but they all share some strengths as well as ideas for improvement which are summarized below:

Strengths of the Programs

1. Innovative and effective classroom presentations.
2. Consistent growth in student enrollments and high success rates.
3. Strong commitment to students' academic success.
4. Ability to offer a comprehensive series of courses to accommodate diverse student's needs from self-enrichment to transfer to rigorous scientific fields of study.

Suggestions for Improvement

1. Create opportunities for the faculty to share their latest ideas for multimedia-based instruction.
2. Update lab and classroom equipment.
3. Explore distance learning to better accommodate students.
4. Improve class schedules particularly for higher unit courses that carry a heavy laboratory component.

Program Review prepared by:

Professor John H. Preston, Astronomy

Dr. Jeanette Medina, Chemistry

Dr. Amelito Enriquez, Engineering

Dr. Martin D. Partlan, Physics

ASTRONOMY

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY

(2 page maximum)

Short Summary of Findings

Type your summary here:

While Astronomy is a small department offering only 3 classes we serve a relatively large number of Cañada students. Astronomy has shown consistently high enrollments and high success rates. We feel very lucky to be teaching in such an exciting discipline and hope that our courses convey a wonder and excitement of the captivating universe around us. Since our last program review we have worked hard to continue to take advantage of the latest multimedia technology in our classes such as Starry Night, Voyager, Redshift and the latest visuals from NASA. In our laboratory class we have revised and added new materials to each of our labs. Our faculty works hard to remain current in this very fast changing field and are actively involved in their field.

Astronomy is often the first science course that our students take and we hope that our courses instill in them a desire to find out more about the world around them by taking other science courses whose ideas and methods are first encountered in astronomy.

Three Strengths of the Program

1. **The advanced use of multimedia in our classroom presentations.**
2. **Our consistently high enrollments and high success rates.**
3. **The use of CD-ROM programs and software in our assignments where our students can not only picture the night sky but travel throughout our solar system.**

Three Suggestions for Improvement

1. **New state-of-the-art laptop computers for classroom demonstrations that are fast enough to run our latest astronomical software.**
2. **Secure a place on campus for night time observations both naked eye and with telescopes.**
3. **Create opportunities for the astronomy faculty to share their latest ideas for multimedia-based instruction.**

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW SELF-STUDY DOCUMENT

In preparing this Program Review, keep the college mission in mind as a reminder that Program Review is to ensure that all programs are aligned with the institutional mission.

Cañada College's Mission: It is the mission of Cañada College to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction in transfer and general education courses, professional/technical programs, basic skills and activities that foster students' personal development and academic success. Cañada College accepts responsibility for serving the community's diverse needs for lifelong enrichment and highly values close teacher to student teaching and learning relationships, support services and a co-curricular environment that contributes to personal growth and success for students.

PROGRAM NAME: Astronomy

PART A: Overview of Program

1. **If the program has completed a previous self-study, evaluate the progress made toward previous goals.**

Goal 1. We do not as yet have student graders for our Astronomy Classes

Goal 2. We have accomplished our goals for providing additional multimedia-based instruction.

Objective 1: Acquire a new multimedia computer for classroom demonstrations.

Objective 2: Update our CD-ROM programs and software. For example, new copies of
- a. Starry Night
- b. Red Shift
- c. A Brief History of Time

Goal 3. The Astronomy Department in conjunction with the Learning Center has met its goal to set up an internet lab site on campus.

Objectives:
- a. Download assignments including sample files
- b. Get help from other students
- c. Work together on group projects

2. State the goals and focus of this program and explain how the program contributes to the mission, comprehensive academic offerings, and priorities of the College and District.

The Astronomy Department fosters students' personal development and academic success by providing a well-rounded curriculum of lecture and laboratory courses that transfer and meet the general education the requirements of both UC and CSU.

We believe that a general education should include science courses as part of an overall program in preparation for a life of intellectual growth and development. We hope that our courses convey a wonder and excitement of the captivating universe around us.

Astronomy is often the first science course that our students take and we hope that our courses instill in them a desire to find out more about the world around them by taking other science courses whose ideas and methods are first encountered in astronomy.

Program Goals

1. Set up a program to provide student graders for astronomy courses.

2. Acquire updated materials for multimedia-based instruction

Objectives:

a. Acquire new laptop computers for classroom demonstrations that are fast enough to run our latest astronomical software.

b. Provide a laptop computer for each astronomy instructor.

c. Collect and develop astronomical images and animations for use in lecture, lab and the Learning Center.

d. Create opportunities for the astronomy faculty to share with each other their latest materials for multimedia-based instruction.

3. Set up an Internet lab site on campus where students will have access to observation of the night sky.

Objectives:

a. Find a place on campus for night time observations both naked eye and with telescopes.

b. Reduce light pollution on campus by using more effective light sources to save financial resources and provide a safe night time environment with darker skies.

c. Set up a location on campus with skies dark enough to see the sky and close to storage for our observational equipment.

3. **If the student population has changed, state how the program is addressing these changes. Document the demographic trends.**

   There is no evidence that our student population has significantly changed.

4. **If the program utilizes advisory boards and/or professional organizations, describe their roles.**

   Our program does not use advisory boards and/or professional organizations.

PART B: Curriculum

1. **Describe how the courses offered in the program meet the needs of the students and the relevant discipline(s). (This may be answered through narrative or quantitative evaluation).**

Astronomy is offered at Canada to fulfill the general science requirements of non-science majors. As such, the course is designed to provide a basic understanding of the scientific method and the way science is conducted, as well as to teach basic astronomy. Particular emphasis is given to correcting common misperceptions about astronomical phenomena. The lab course is designed to use actual data and measurement, to help students get a feel for what scientific research is like and the origins of the material covered in lecture.

Currently there are three astronomy courses offered: Astr 100, a 3-unit introductory lecture class, Astr 101, a 1-unit laboratory class, and Astr 110 a 3-unit lecture class on Cosmology. Astronomy 100 is the co-requisite or pre-requisite to 101. All courses are transferable to UC and CSU and meet general education transfer and AA degree requirements

2. **State how the program has remained current in the discipline(s).**

Advances in astronomy have the advantage of being widely published and easily available. Each semester some newsworthy event or observation occurs and is presented in class as part of the lecture. The NASA, JPL, European Space Agency and The Hubble Space Telescope websites offer excellent resources for current information. Our faculty survey current scientific journals such as Sky & Telescope, Scientific American and Mercury Magazine for the latest research and occurrences in their field.

3. **All course outlines in this program should be reviewed and, if appropriate, revised every six years. If this has not occurred, please list the courses and present a plan for completing the process.**

All three astronomy courses have been reviewed within the last six years. The program is current with respect to college, district, and Title V regulations.

4. **If external accreditation or certification is required, please state the certifying agency and status of the program.**

No external accreditation or certification is required

5. **Describe how your program is articulated with similar departments within SMCCD, the Sequoia High School District and/or other four year institutions. (Include articulation agreements, common course numbering etc.)**

All of our classes have the same course numbering as their counterparts at CSM. Skyline does not currently offer astronomy classes.

6. **Discuss plans for future curricular development and/or program modification.**

Our students receive a computerized planetarium program each semester through the bookstore with their textbook. Our faculty develop assignments where our students observe animations of the night sky (utilizing this planetarium program) not only from earth but from other places in our solar system to better understand the universe around us.

We are currently working to integrate learner-centered materials from the Conceptual Astronomy and Physics Education Research Team at NASA's JPL into the lecture courses.

PART C: Student Outcomes

1. **Please attach all Bi-Annual State of the Department reports from the past six years.**

We have no Previous Bi-Annual State of the Department reports.

2. **Update any analysis to include a summary of all years. Attach student learning outcomes here.**

Our department has not completed the SLO's for our courses.

PART D: Faculty and Staff

1. **List current faculty and staff members in the program, areas of expertise, and how positions contribute to the program success.**

Professor Jack Preston is our only full time faculty member currently teaching astronomy classes. He is one of the very first instructors to incorporate the use of multimedia in lecture presentations, and to routinely use computer programs and the internet for assignments.

Dr. Jeanne Digel Ph. D., Physics is our adjunct faculty member. Her background in astronomy includes early work, and one publication on late-stage stellar evolution.

2. **List major professional development activities completed by faculty and staff in this program in the last six years and state what development is needed or proposed by faculty in this program.**

Jack Preston is a member of the Astronomical Society of the Pacific, The East Bay Astronomical Society, and The Fremont Peak Observers Association and regularly attends meetings and lectures of these and other groups in the Bay Area. He has traveled to Turkey as part of astronomical group to study a solar eclipse. He was interviewed on the local news describing a lunar eclipse at the Cabot Space and Science Center. And he was part of a public outreach program providing lunar observing from the deck of the Hornet Aircraft carrier in celebration of the first Lunar Landings.

Jeanne Digel attends curriculum based workshops such as a 2 day workshop on introductory astronomy courses for non-majors by the Conceptual Astronomy and Physics Education Research Team (NASA, JPL) offered in San Francisco.

3. **Describe the departmental orientation process for new full-time and adjunct faculty and staff (please include student workers such as tutors and aides).**

Our orientation process for new full-time and adjunct faculty is the same as the Science and Technology Division.

PART E: Facilities, Equipment, Materials and Maintenance

1. **Discuss the quality and accessibility of the facilities, equipment, equipment maintenance, and materials available to the program. List projected needs.**

With the advent of smart classrooms at Cañada our department has been able to better integrate computer animation and the internet into our classroom lectures and demonstrations. The equipment in Building 22 has been a real boon to our program. We have very adequate telescopes and observing equipment but with the increase in light pollution at our campus we are unable to properly use them. We need a convenient location where we would be able to observe the night sky such as the area near the portable building 21.

The department possesses three high quality telescopes, but little dark observing space limits their usefulness. In Spring 2003 using money from the Trustee's fund for program improvement we purchased celestials spheres and hand-held spectrometers which are used in labs. The lab course also makes use of various lamps, variable transformers, and chemicals (for building comet nuclei) supplied from physics and chemistry stores. The physics computer lab is also used for two exercises.

2. **Describe the use and currency of technology. List projected needs.**

Our program requires the use of up-to-date computer equipment to show our students the current planetary software and for our faculty to share with each other their work in the use of this software. Our current equipment is inadequate for this purpose. We need a modern laptop computer for each of our faculty members.

3. If applicable, describe the support the program receives from industry. If the support is not adequate, what is necessary to improve that support?

We do not currently require industry support.

PART F: Budget Request

1. What faculty positions will be needed in the next six years in order to maintain or build the department?

We will need one new full time faculty member.

2. What staff positions will be needed in the next six years in order to maintain or build the department? (Staff, facilities, equipment and/or supplies) will be needed in the next six years?

None

3. What equipment will be needed in the next six years in order to maintain or build the department?

Up-to-date computers

4. What facilities will be needed in the next six years in order to maintain or build the department?

A place on campus from which to observe the night sky.

PART G: Additional Information

1. Describe any other pertinent information about the program that these questions did not address?

To help with our students' success our faculty strongly supports our Library and Learning Center and routinely hold office hours in the Learning Center. They ensure that all students are introduced to the College Library and hold at least one meeting each semester in the Library where the students receive instruction in research into scientific topics. Our Faculty actively recommend students to serve as tutors and are very supportive of the Learning Center's Tutorial Program.

CAÑADA COLLEGE
BI-ANNUAL STATE OF THE DEPARTMENT
DATA COLLECTION DOCUMENT

Program Name: Astronomy

I. Program goals and objectives:

The Astronomy Department fosters students' personal development and academic success by providing a well-rounded curriculum of lecture and laboratory courses that transfer and meet the general education the requirements of both UC and CSU.

We believe that a general education should include science courses as part of an overall program in preparation for a life of intellectual growth and development. We hope that our courses convey a wonder and excitement of the captivating universe around us.

Astronomy is often the first science course that our students take and we hope that our courses instill in them a desire to find out more about the world around them by taking other science courses whose ideas and methods are first encountered in astronomy.

II. Student Learning Outcomes:

A. **List all identified program student learning outcomes:**
Our department has not completed the SLO's for our courses.

B. **Attach correlated assessment tools and relevant data:**
Our department has no correlated assessment tools.

C. **List a sample of course level student learning outcomes:**
Our department has not completed the SLO's for our courses.

D. **Attach correlated assessment documents and relevant data:**
Our department has no correlated assessment tools.

III. Curricular offerings:

A. New, deleted, "banked" and "unbanked" in the past two years (check all that apply)

Course Prefix	Course Number	Course Title	NEW	Delete	Bank	Unbank	General Education	IGETC	AA/AS	Basic Skills	Workforce

rate for the past 2 Fall semesters with the most recent on the right.

Year	2004	2005
Retention	85.29%	85.99%
Success	73.53%	75.16%

D. Certificate, degree, and transfer status (If applicable) Report data on certificate, degree, and transfer status for the past 2 years with the most recent on the right.

Year	2004	2005
Certificates		
Degrees		
Transfer		

E. Please comment on any trends that you see in the programs WSCH, FTES, LOAD, success and retention rates. Include factors that affect the rates and how college services are used to provide multiple avenues for student success. Include an indication of the other goals that your students have in taking your courses and how they may be meeting multiple educational goals i.e., job out, promotion, retraining etc.

V. Faculty and staff hiring recommendations:

A. List full-time faculty requests and attach formal justification

Position	Areas of expertise needed

B. List adjunct faculty requests and attach formal justification

Position	Areas of expertise needed

C. List staff requests and attach formal justification

Position	Areas of expertise needed

D. List professional development needs:

VI. Equipment and facilities recommendations:

A. List equipment, technology, materials needed in the coming year:

Item	Cost per unit
Laptop Computers	$2000

CHEMISTRY

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY

(2 page maximum)

Short Summary of Findings

Type your summary here:

The Chemistry Department at Cañada College has experienced a variety of changes in a short period of time. In 1997-1998, there were two full-time faculty, two adjunct faculty and one instructional aide. The last program review document (1997-1998) reports a decline in the number of enrollments. Shortly after, both full-time faculty retired, the instructional aide assumed a different position at another Division and enrollments continued to decline. In the Fall of 2001, there was a recently hired instructional aide and only two adjunct faculty teaching just two chemistry courses, hardly enough course work to support either students wishing to transfer or obtain an Associate degree in Physical Sciences-Chemistry. WSCH were 393 and FTES was 13.10 with retention of 69% and a success of only 56%. Currently, the Chemistry Department consists of one full-time faculty, three adjunct faculty, one instructional aide and one student assistant. We are all working at capacity and there are several projects on hold. The number of courses we offer has increased to five in the Fall semester and six in the Spring semester. There are several courses that we offer once a year. Compared to Fall 2001, WSCH have increased by 175% to 1084, FTES has increased by 176% to 36.2, retention has increased to 85.92% and success has increased to 84.51%.

There are several factors that have stimulated the Chemistry Department's growth:

a. The establishment of the Bachelor in Science-Nursing Program in partnership with San Francisco State University on campus in Fall of 2004.
b. The introduction of a two-semester sequence Organic Chemistry courses.
c. The strong academic and student service support provided by the library, learning center and MESA center.
d. The interdisciplinary interaction with other Science and Technology Division's programs such as Biology, Engineering, Physics, Radiologic Technology.
e. The strong support of the Administration.
e. The strong commitment of all the members of our Department to students' success.

The Chemistry Department is without a doubt a student-centered Department that strives to instill long-lasting learning of the subject by providing students with excellence in teaching, comparable lower division curriculum to University of California campuses, California State University campuses and Private Universities, multi-media classroom instruction delivery, up-to-date experimentation techniques and laboratory safety considerations, state of the art instrumentation, computer based laboratory instruction, opportunities for independent literature search projects, opportunities for study group interactions, opportunities to take advantage of our variety of student support services.

Three Strengths of the Program

1. **Strong commitment to students' academic success.**

2. **Ability to offer a comprehensive series of courses to accommodate diverse student needs for self-enrichment to transfer to rigorous scientific fields of study.**

3. **Ability to collaborate in a variety of projects with the College's academic support services.**

Three Suggestions for Improvement

1. **Improve class schedules particularly for five unit courses that carry six hours of laboratory per week.**

2. **Grant a new full-time faculty position and office space for our instructional aide.**

3. **Acquisition of several computers and various laboratory equipment to support the Organic Chemistry courses in particular.**

***Sorry, I needed a fourth one.**

4. **To create discipline specific development opportunities for the Chemistry Faculty and Staff.**

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW SELF-STUDY DOCUMENT

In preparing this Program Review, keep the college mission in mind as a reminder that Program Review is to ensure that all programs are aligned with the institutional mission.

Cañada College's Mission: It is the mission of Cañada College to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction in transfer and general education courses, professional/technical programs, basic skills and activities that foster students' personal development and academic success. Cañada College accepts responsibility for serving the community's diverse needs for lifelong enrichment and highly values close teacher to student teaching and learning relationships, support services and a co-curricular environment that contributes to personal growth and success for students.

PROGRAM NAME: CHEMISTRY

PART A: Overview of Program

1. **If the program has completed a previous self-study, evaluate the progress made toward previous goals.**

   The previous Chemistry Department Program review dates 1997-1998. None of the individuals, either Faculty (Fulltime or Adjunct) or staff, who contributed to the 1997-1998 Program Review are part of the Chemistry Department any longer.

   All of the goals listed under section IA. Goals and Focus of the Program, have either been met and/or are continuously implemented. One noticeable exception is item number 3. since we currently offer a one-semester comprehensive chemistry course for the allied health professionals instead of a two-semester sequence as stipulated on the previous Program Review. Furthermore, this course is not a requirement for Cañada's Radiologic Technology program as so stated. Please see appendix B for an excerpt of the Chemistry Department Program Review document.

   Some of the Program Goals have not been met. These are: 1c. To obtain either computer software for chemical modeling of reactions or molecules, or to obtain multimedia resources for the same purpose. 2a. To support and encourage chemistry faculty to submit professional development proposals to aid them to enhance their expertise and ability in curriculum development and delivery.

2. **State the goals and focus of this program and explain how the program contributes to the mission, comprehensive academic offerings, and priorities of the College and District.**

   In a very broad context, the goals and focus of the Chemistry Program are:

1. To service other scientific disciplines by providing courses that fill their individual requirements and pre-requirements in preparation for Associate degrees in programs such as Radiologic Technology for example.
2. To offer rigorous and sufficient course work to support an Associate Degree in Physical Sciences with Chemistry concentration.
3. To offer rigorous and sufficient lower-level division course work to students preparing to transfer into a variety of programs such as Biology, Chemistry, Engineering, Nursing, etc.
4. To offer less rigorous courses that will service students who are non-science majors but need to take science courses for general education requirements or simply for self-enrichment.

3. If the student population has changed, state how the program is addressing these changes. Document the demographic trends.

The student population enrolled in chemistry classes has not significantly changed during Fall semester 2003 to Spring semester 2005 as indicated by the student demographics statistical analysis by subject data available from the Office of Instruction. Furthermore, retention and success data by ethnicity and gender available for Fall 2003, Fall 2004 and Fall 2005, clearly indicate that the Chemistry Program has performed either the same or better than the overall retention and success of the College. Please see appendix A.

4. If the program utilizes advisory boards and/or professional organizations, describe their roles.

The Program does not utilize advisory boards or professional organizations.

PART B: Curriculum

1. Describe how the courses offered in the program meet the needs of the students and the relevant discipline(s). (This may be answered through narrative or quantitative evaluation).

Course name	**Intended students**
- Survey of Chemistry, CHEM 100 (3 units)	Telecourse, General Education.
- Chemistry in action, CHEM 112 (4 units)	Liberal Arts General Education science class with laboratory.
- Elementary Chemistry, CHEM 192 (4 units)	Preparatory course for science major with no previous chemistry exposure. Recommended for Radiologic Technology program.
- General Chemistry I, CHEM 210 (5 units)	Science majors: Physical Sciences, Biology, Engineering, Pre-Professional, some Nursing.
- General Chemistry II, CHEM 220 (5 units)	Science majors: Biology, Pre- Professional, Chemical Engineering and/or all Engineering If transferring to UC-Davis.
- Organic Chemistry I, CHEM 234	Science majors: Physical Sciences, Biology,

Lecture (3 units)	Biochemistry, Pre-Professional. To be taken concurrently with CHEM 237 unless not required by major.
- Organic Chemistry Laboratory I , CHEM 237 (2 units)	Physical Sciences, Biology, Biochemistry, Pre-Professional.
- Organic Chemistry II, CHEM 235 Lecture (3 units)	Physical Sciences, Science majors: Biology, Biochemistry, Pre-Professional. To be taken concurrently with CHEM 238 unless not required by major.
- Organic Chemistry Laboratory II, CHEM 238 (2 units)	Biology, Biochemistry, Pre-Professional.
- Chemistry for Allied Health Sciences, CHEM 410 (4 units)	General, Organic and Biochemistry topics. Preferred chemistry requirement to transfer to University Center Nursing Program. It might not be the preferred requirement to transfer to other Nursing Programs.

2. State how the program has remained current in the discipline(s).

The Program has remained current in Chemistry by:
- Revising and adopting up to date editions of textbooks.
- Providing students with traditional and internet bibliographic research opportunities to get informed of current issues in the field of chemistry and related disciplines.
- Revising comparable course outlines offered at other Colleges and Universities.
- Making computers amply available to students in the laboratory to be used for data acquisition, data manipulation and graphing, internet research of chemical compounds and catalogs, etc.
- Purchasing software for experimental data gathering and analysis.
- Reviewing experimental protocols and safety data information to comply with state and federal safety rules and regulations.
- Acquiring state-of-the-art equipment for students use. For example, our recently acquired FT-IR (Fourier transform infrared) spectrophotometer, instrument that is common use in research institutions and research laboratories in many industries
- Establishing collaboration with partners such as Gene Connection. We had had Genconnection personnel come to our laboratories for hands-on demonstrations of state-of-the-art instruments used in research industry such as the AGILENT ultraviolet-visible spectrophotometer models they own and house as part of their collaboration with Genentech.
- Some members of our Faculty are members of the American Chemical Society and attend discipline conferences.

3. All course outlines in this program should be reviewed and, if appropriate, revised every six years. If this has not occurred, please list the courses and present a plan for completing the process.

Course outlines (except for CHEM 100 which is a telecourse that originates from College of San Mateo) of all courses offered have been reviewed. Copies of all course outlines are included as supplemental materials.

Course	Date of original submission or revision
CHEM 112	October 31, 2002
CHEM 192	November 8, 2004
CHEM 210	November 8, 2004
CHEM 220	November 8, 2004
CHEM 234	October 19, 2003
CHEM 235	October 27, 2003
CHEM 237	October 27, 2003
CHEM 238	October 28, 2003
CHEM 410	November 17, 2003

4. If external accreditation or certification is required, please state the certifying agency and status of the program.

The Chemistry Program gets certified as part of the Cañada College general accreditation process. As stated on page 4 of the 2005-2006 Cañada College catalog: "Cañada College is accredited by the Accrediting Commission for Community Colleges and Junior Colleges of the Western Association of School and Colleges, ..,"

5. Describe how your program is articulated with similar departments within SMCCD, the Sequoia High School District and/or other four year institutions. (Include articulation agreements, common course numbering etc.)

Chemistry courses at Cañada College have been assigned California Articulation Numbers (CAN) to identify comparable lower division coursework at participating California State University (CSU), University of California (UC), and private/independent colleges and universities. Information about participant CAN colleges and universities is available at *www.csus.edu*. A list of courses offered at Cañada College, assigned CAN, comparable courses offered at College of San Mateo (CSM), Skyline College, and University of California-Davis is included in the table below (all CHEM courses):

Cañada	CAN	CSM	Skyline	UC-Davis
100	CSU: B1; UC*, IGETC 5A	100	NA	NA
112	CSU: B1, B3; UC*	NA	112 (no math requirement	NA
192	CSU, UC*	192	192	NA
210	CHEM 2 or SEQ A	210	210	2A, 2B
220	CHEM 4 or SEQ A	220	220	2B, 2C
234	CSU: B1; UC; IGETC 5A	231	234	128A,B
235	CSU: B1; UC; IGETC 5A	232	235	129B,C
237	CSU: B!, B3; UC; IGETC 5A*	231 lab	237	129A
238	CSU: B1, B3; UC; IGETC 5*	232 lab	238	129B
410	CSU: B1, B3	410, 420	410	NA

6. **Discuss plans for future curricular development and/or program modification.**

   - Chemistry in Action, CHEM 112 has experienced a decline in enrollments. Research about the cause needs to be done to make recommendations on modifications or improvement on the course as appropriate. Some of the items to research are: changing the semester in which the class is offered, increase the participation of the counseling department regarding student awareness and recommendation when appropriate, find ways to better advertise the availability of this class when offered.

   - An enrollment assessment needs to be performed for General Chemistry I, CHEM 210 to determine the need for an additional laboratory section or even an additional complete lecture and lab section.

   - Enrollments in general chemistry II CHEM 220 have experienced considerable growth this semester. We are currently offering this class only in the Spring semester due to low enrollments in the past. We might need to re-assess this decision to start offering this class every semester again

   - Five unit courses are traditionally taught on a MWF lecture, TTh lab format which represents an everyday meeting. A proposal for switching to a two-day format, either MW or TTh with one and a half hours lecture followed by three hours laboratory on each day needs to be evaluated.

   Please note that our faculty and staff needs could increase dramatically if any or all of the changes mentioned above were to take place. This issue will be discussed in detail in Part F: Budget Request.

PART C: Student Outcomes

1. **Please attach all Bi-Annual State of the Department reports from the past six years.**

   No previous Bi-Annual State of the Department reports have been done. A 2004-2005 Bi-Annual State of the Department report has been created along with the Comprehensive Program Review Self-Study document. Please refer to appendix A for WSCH, FTE, FTES, LOAD, retention and success data from Fall 2000 to Fall 2005, and retention and success data based on demographics for Fall 2003, Fall 2004 and Fall 2005.

2. **Update any analysis to include a summary of all years. Attach student learning outcomes here.**

   Complying with Cañada College's efforts to create Student Learning Outcomes (SLO's), the Chemistry Department is currently working on this project. We include some examples of Program SLO's and Course SLO's from work is now in progress.

   a. Program Student Learning Outcomes:

Students who have completed the Physical Sciences-Chemistry Program at Cañada College will be able to:

- Communicate effectively using chemistry terminology.
- Apply analytical reasoning and problem solving skills on chemical projects.
- Solve a variety of chemical problems involving both general chemistry and organic chemistry.
- Formulate hypothesis, design experiments, test formulated hypothesis by collecting, analyzing and interpreting data and write comprehensive formal reports summarizing experimental findings using appropriate chemical terminology.
- Operate typical laboratory instrumentation available at research institutions or industry.

b. Course level Student Learning Outcomes

After completing CHEM 112, students will be able to:

- Develop appreciation for the chemistry field.
- Apply the scientific method.
- Use chemical nomenclature.
- Analyze information given on the periodic table.
- Perform simple stoichiometric calculations.
- Apply chemistry concepts to everyday life.
- Identify hydrocarbons and polymers.
- Describe chemical reactions of the atmosphere.
- Analyze the mode of action of selected household products.
- Perform experiments with food items such as carbohydrates, fats and proteins.

After completing CHEM 192, students will be able to:

- Apply the scientific method.
- Use units of length, mass, volume and temperature in calculations.
- Identify physical and chemical properties as well as states of matter.
- Use chemical nomenclature and gather information from the periodic table.
- Balance chemical equations and perform simple stoichiometric calculations.
- Describe the atomic structure.
- Apply quantum numbers to identify atomic orbitals.
- Write electron configurations and analyze periodic trends of atomic properties.
- Apply gas laws in a variety of calculations.
- Describe the properties of liquids and solutions including colligative properties.

After completing CHEM 210, students will be able to:

- Apply the scientific method.
- Classify matter.
- Identify elements, compounds, monoatomic ions, polyatomic ions.
- Perform dimensional analysis calculations.

- Identify subatomic particles.
- Gather information from the periodic table.
- Use the concept of mole and molar mass.
- Perform complex stoichiometric calculations.
- Identify types of aqueous chemical reactions.
- Apply thermochemical principles to calculate heat of reactions.
- Predict electronic configuration and magnetic properties of atoms and ions.
- Describe bonding and molecular geometries.
- Perform calculations using gas laws and gas stoichiometry.
- Describe intermolecular forces in liquids and solids.
- Use units of concentration in calculations.

After completing CHEM 220, students will be able to:

- Write rate laws and determine rate order.
- Draw qualitative energy diagrams to represent activation energy.
- Predict reaction mechanism.
- Define chemical equilibrium and perform calculations using equilibrium constants.
- Describe acid-base equilibrium reactions.
- Apply Ka, Kb, pKa, pKb, and pH concepts on complex equilibrium calculations.
- Create acid-base titration curves.
- Describe the behavior of buffers.
- Predict precipitation reactions from solubility product constant data.
- Describe enthalpy, entropy and free energy as it applies to spontaneous processes.
- Balance redox reactions.
- Construct simple voltaic cells and perform calculations involving reduction potentials.
- Describe the chemistry of the main group elements and of the transition elements.
- Use the band of stability to predict radioactive decay.
- Identify some applications of nuclear chemistry.

After completing CHEM 234, students will be able to:

- Apply hybridization, molecular orbital theory, resonance, molecular geometry, electronegativity and polarity to representative organic molecules.
- Identify different functional groups.
- Use curved arrow notation to illustrate reaction mechanisms.
- Use the IUPAC system to name several classes of organic compounds.
- Identify the main type of organic chemistry reactions.
- Use a variety of rules to predict the outcome of organic chemistry reactions.
- Use a variety of spectroscopic techniques to determine molecular structure.

- After completing CHEM 235, students will be able to:

- Describe the typical reactions of benzene and its derivatives. Draw reaction mechanisms.

- Summarize synthetic methods to prepare a variety of functional groups such as: aldehyde, ketone, ester, amide, anhydride, carboxylic acid, amine.
- Explain the relative acidity of carboxylic acids based on inductive and resonance effects.
- Predict the relative bacisity of a series of amines.
- Apply a variety of synthetic methods to identify the most appropriate synthetic route to obtain given organic molecules.
- Apply retrosynthesis.
- Classify carbohydrates, lipids and steroids.
- Identify structural differences among aminoacids, peptides, nucloproteins, nucleotides, nuclosides.
- Determine DNA base sequencing and describe the biological importance of DNA and RNA.

After completing CHEM 237, students will be able to:

- Identify hazardous organic materials and appropriate safe handling and disposal.
- Write scientific experimental reports on a laboratory notebook.
- Handle common microscale organic chemistry laboratory equipment,
- Determine physical properties such as boiling point, melting point, density, refractive index.
- Separate mixtures by solvent extraction and simple or fractional distillation.
- Purify samples by crystallization and sublimation techniques.
- Analyze mixtures by column chromatography and thin layer chromatography.
- Interpret infrared and nuclear magnetic resonance spectra.
- Perform single step synthesis.

After completing CHEM 238, students will be able to:

- Perform multi-step syntheses.
- Carry out Grignard reactions, aldol condensations, nucleophilic aromatic substitution reactions, ester saponification reactions.
- Identify functional groups on infrared spectra.
- Perform preliminary identification tests to several organic unknowns, carry out classification tests, prepare, purify and determine physical and infrared spectra of derivatives, analyze combined data to identify unknowns.

After completing CHEM 410, students will be able to:

- Apply the scientific method.
- Develop appreciation for the chemistry field as it applies to the biological field.
- Use chemical terminology to describe chemical processes.
- Perform simple calculations using the metric system.
- Describe radioactive chemistry: its biological effects and medical applications.
- Describe the properties of gases and perform simple calculations.
- Perform simple calculations using heat energy and caloric values.

- Analyze the factors that affect solubility.
- Describe osmosis and dialysis.
- Identify acids, bases, buffers and neutralization reactions.
- Recognize the main functional groups in organic chemistry.
- Classify carbohydrates.
- Describe the classes of lipids and their biological significance.
- Define aminoacids, peptides, proteins and enzymes. Indicate biological significance derived from chemical structural differences.

PART D: Faculty and Staff

1. **List current faculty and staff members in the program, areas of expertise, and how positions contribute to the program success.**

Fulltime Faculty:
Jeanette C. Medina, Ph. D., Chemistry
My graduate work at the University of Miami was in the area of Organic Chemistry that resulted in co-authoring fourteen research papers published in recognized scientific journals. While in search for a teaching opportunity, I served in different capacities at various Colleges and Universities which allowed me to experience diverse student bodies and diverse mission, goals and philosophy statements at different institutions. During my venture at Cañada College and with the help of my colleagues, I have worked to revitalize the Chemistry Program, modernize the chemistry laboratories, increase the available resources at the library, learning center and MESA center, increase participation and visibility of the Department College-wide, strengthen the relationship with the counseling and articulation Departments, and get students to take active participation in the learning and teaching of Chemistry. I have also participated in diverse activities such as High school days, National Chemistry Day, Cañada Scholarships reader and presenter, MESA awards presenter and Faculty Advisor for the newly created Careers in Science Club. In addition, I have attended several faculty development workshops at the College and participated in various College-wide and Division Committees.

Adjunct Faculty:
Anuradha Pattanayak, Ph. D., Chemistry
I have a Ph.D in Chemistry. I have co-authored 13 research papers that have been published in international journals. I worked at General Electric Research and Development Center in Niskayuna, NY for two years. I wrote an internal report on the quality control issues involved in the production of Polyimides which GE manufactures. I taught at Hudson Valley Community College in Troy, NY for nine years. I attended multi-media conferences held annually at HVCC and attended regularly two-year college conferences. At HVCC and now at Cañada, I have played a leading role in organizing the National Chemistry Day activities. I have been teaching at Cañada College for the last four years. I have been involved in teaching a variety of courses at Cañada. I have helped in the development of the Chemistry Department at Cañada. I am a member of the American Chemical Society. I am currently teaching at Cañada College and DeAnza College.

Mr. Mohinder Bhatia, M.S. in Computer Science and Chemistry

I have been teaching Chemistry for 25 years in various community colleges. I am currently teaching General Chemistry at Cañada College and Chabot College.

Mrs. Angie Adams Bond, M.S., Chemistry
My graduate research in organic and biological chemistry at Stanford University taught me important laboratory techniques and skills that I can bring to the students. My teaching experiences in General and Organic Chemistry at the college level have heightened my abilities and confidence as an instructor.

Instructional Aide
Mrs. Constanta Lazar, M. S., Pharmacy
I have worked in the District for fifteen years as a Laboratory Technician for the Chemistry Department at Skyline College and currently, as an Instructional Aide for the Physical Sciences Department which includes Astronomy, Chemistry, Engineering, Electronics, Geology and Physics.

Student Assistant
Patricia Pickett-Wilde
Undergraduate student pursuing a major in Nursing.

2. List major professional development activities completed by faculty and staff in this program in the last six years and state what development is needed or proposed by faculty in this program.

Faculty have participated in the following professional development workshops:
- Teacher as a Grader, Teacher as Assessor: Changing Roles? (February 2003)
- Development of an Instructional Webpage. (May 2004).
- Student Learning Outcomes (August 2005).
- Banner-user workshop (Fall 2005)
- College-wide meetings discussing various topics.

It has been difficult for the only one fulltime faculty to take advantage of all the on-campus faculty development workshops due to many laboratory student contact hours required on our discipline. Furthermore, going off-campus for any seminar, workshop or mini-course is just out of reach. It is our deepest hope that we could add a much needed additional fulltime faculty member to open up our possibility to attend the many opportunities around the Bay Area. There are several areas of faculty development needed: instructional webpage, multimedia lecture delivery, effective use of smart classrooms, lab-pro data acquisition program applications, infrared spectroscopy applications, and, in general, keeping up-to-date on the discipline changes, laboratory experiments modifications, new experimental techniques and new applications of common experimental techniques.

3. Describe the departmental orientation process for new full-time and adjunct faculty and staff (please include students such as tutors and aides).

The Chemistry Department follows the orientation process put forth by the Science and Technology Division.

PART E: Facilities, Equipment, Materials and Maintenance

1. Discuss the quality and accessibility of the facilities, equipment, equipment maintenance, and materials available to the program. List projected needs.

Regarding facilities:
Laboratory rooms are starting to show signs of aging. There are several items such as plumbing, sink and drain fixtures that need to be replaced but comparable parts are not available. Chalkboard space is limited and inappropriate. The light sensors in room 18-311 need to be adjusted as well as the clocks in both laboratory rooms. The ventilation system in the chemical storage room needs to be updated. There is limited accessibility for physically disabled students. We are hoping that many, if not all, of these concerns can be addressed with the upcoming renovation project scheduled to start at the end of August of 2006.

Regarding equipment and materials:
Enrollments continue to grow and new classes continue to be added. Students are asked to work with a partner so we can share glassware and equipment.
Projected needs are: at least five Analog Spectronic 20+ spectrophotometers for CHEM 210 and CHEM 220 use at a cost of $ 8,500, fifteen organic chemistry micro kits at a cost of $4,500, one explosive, flammable proof refrigerator at a cost of $ 3,000 and a gas chromatograph at a cost of $ 16,000 for CHEM 237 and CHEM 238. In addition, various glassware items are required to allow for each student to have their own equipment during experiments.

Regarding maintenance:
Budget allocation for equipment maintenance should be increased to adjust for new expenses due to: new equipment recently purchased or to be purchased and increased of specialized waste disposal from the organic chemistry laboratories as well as to accommodate for inflation. We estimate an increase of $ 2,000 for glassware replacement and waste disposal and an increase of $ 1,000 for equipment upkeep and maintanace.

2. Describe the use and currency of technology. List projected needs.

The laboratories have available computers connected to the internet and equipped with data acquisition programs for collection, analysis and graphing experimental data. The quantity of computers is limited however. At the moment we have a total of 11 computers, four of which are outdated, which is hardly sufficient when there are two lab sections of 20-30 students running simultaneously. We would need 25 additional computers and 25 additional lab-pro set ups at a cost of $ 33,150. In addition, we would need 2 additional printers at a cost of $ 640.

3. **If applicable, describe the support the program receives from industry. If the support is not adequate, what is necessary to improve that support?**

   The Chemistry Program does not receive direct support from industry. During the academic year 2005-2006 we started a partnership program with Geneconnection. Geneconnection staff comes to the chemistry laboratory to introduce a piece of instrumentation used in common industry research laboratories. We will like to improve industry support by improving communication and assessing the viability of creating new academic programs that will allow for a greater industry-chemistry partnership.

PART F: Budget Request

1. **What faculty positions will be needed in the next six years in order to maintain or build the department?**

   We will need one additional fulltime faculty member, if the program runs at the current capacity. We will need two additional fulltime faculty members, if new programs of study are established in collaboration with industry. (Biotechnology for example)

2. **What staff positions will be needed in the next six years in order to maintain or build the department? (Staff, facilities, equipment and/or supplies) will be needed in the next six years?**

   We actually need a 20 h/w lab technician at the current capacity. If number of classes increases or the number of sections for the current classes increases and we also add new programs, we will need an additional fulltime lab technician.

3. **What equipment will be needed in the next six years in order to maintain or build the department?**

   Please see part E sections 1 and 2 above.

4. **What facilities will be needed in the next six years in order to maintain or build the department?**

   We believe that remodeling of the current facilities along with some modification of our current scheduling might be sufficient to maintain the Department and accommodate for growth. However, we are in need of two offices, one to be shared by Adjunct Faculty and one to be used by our Instructional Aide.

PART G: Additional Information

1. **Describe any other pertinent information about the program that these questions did not address?**

The Chemistry Department would like to look into the following issues:

- A more convenient schedule of classes that will potentially increase enrollments across disciplines.

- Improve the current laboratory manuals to be offered to students at a lower cost. This can be done by Adjunct Faculty with appropriate compensation.

The Chemistry Faculty is actively engaged in student success by:
- facilitating tours of the library, learning center and MESA center.
- encouraging students to become peer tutors.
- establishing study groups.
- arranging bibliographic research and writing workshops specifically targeted to a chemistry research paper.
- holding frequent problem solving sessions at the learning center.

CAÑADA COLLEGE
BI-ANNUAL STATE OF THE DEPARTMENT
DATA COLLECTION DOCUMENT

Program Name: CHEMISTRY

I. Program goals and objectives:

1. To service other scientific disciplines by providing courses that satisfy their individual requirements and pre-requirements in preparation for Associate degrees in programs such as Radiologic Technology for example.
2. To offer rigorous and sufficient course work to support an Associate Degree in Physical Sciences with Chemistry emphasis.
3. To offer rigorous and sufficient lower-division course work to students preparing to transfer into a variety of programs such as Biology, Chemistry, Engineering, Nursing, etc.
4. To offer less rigorous courses that will service students who are non-science majors but need to take sciences courses for general education requirements or simply for self-enrichment.

II. Student Learning Outcomes:

A. **List all identified program student learning outcomes:**

- Communicate effectively using chemistry terminology.
- Apply analytical reasoning and problem solving skills on chemical projects.
- Solve a variety of chemical problems involving both general chemistry and organic chemistry.
- Formulate hypothesis, design experiments, test formulated hypothesis by collecting, analyzing and interpreting data and write comprehensive formal reports summarizing experimental findings using appropriate chemical terminology.
- Operate typical laboratory instrumentation available at research institutions or industry.

B. **Attach correlated assessment tools and relevant data:**

No assessment tool available at this time.

C. **List a sample of course level student learning outcomes:**

After completing CHEM 112, students will be able to:

- Develop appreciation for the chemistry field.
- Apply the scientific method.
- Use chemical nomenclature.
- Analyze information given on the periodic table.
- Perform simple stoichiometric calculations.
- Apply chemistry concepts to everyday life.

- Identify hydrocarbons and polymers.
- Describe chemical reactions of the atmosphere.
- Analyze the mode of action of selected household products.
- Perform experiments with food items such as carbohydrates, fats and proteins.

After completing CHEM 192, students will be able to:

- Apply the scientific method.
- Use units of length, mass, volume and temperature in calculations.
- Identify physical and chemical properties as well as states of matter.
- Use chemical nomenclature and gather information from the periodic table.
- Balance chemical equations and perform simple stoichiometric calculations.
- Describe the atomic structure.
- Apply quantum numbers to identify atomic orbitals.
- Write electron configurations and analyze periodic trends of atomic properties.
- Apply gas laws in a variety of calculations.
- Describe the properties of liquids and solutions including colligative properties.

After completing CHEM 210, students will be able to:

- Apply the scientific method.
- Classify matter.
- Identify elements, compounds, monoatomic ions, polyatomic ions.
- Perform dimensional analysis calculations.
- Identify subatomic particles.
- Gather information from the periodic table.
- Use the concept of mole and molar mass.
- Perform complex stoichiometric calculations.
- Identify types of aqueous chemical reactions.
- Apply thermochemical principles to calculate heat of reactions.
- Predict electronic configuration and magnetic properties of atoms and ions.
- Describe bonding and molecular geometries.
- Perform calculations using gas laws and gas stoichiometry.
- Describe intermolecular forces in liquids and solids.
- Use units of concentration in calculations.

After completing CHEM 220, students will be able to:

- Write rate laws and determine rate order.
- Draw qualitative energy diagrams to represent activation energy.
- Predict reaction mechanism.
- Define chemical equilibrium and perform calculations using equilibrium constants.
- Describe acid-base equilibrium reactions.
- Apply Ka, Kb, pKa, pKb, and pH concepts on complex equilibrium calculations.
- Create acid-base titration curves.
- Describe the behavior of buffers.

- Predict precipitation reactions from solubility product constant data.
- Describe enthalpy, entropy and free energy as it applies to spontaneous processes.
- Balance redox reactions.
- Construct simple voltaic cells and perform calculations involving reduction potentials.
- Describe the chemistry of the main group elements and of the transition elements.
- Use the band of stability to predict radioactive decay.
- Identify some applications of nuclear chemistry.

After completing CHEM 234, students will be able to:

- Apply hybridization, molecular orbital theory, resonance, molecular geometry, electronegativity and polarity to representative organic molecules.
- Identify different functional groups.
- Use curved arrow notation to illustrate reaction mechanisms.
- Use the IUPAC system to name several classes of organic compounds.
- Identify the main type of organic chemistry reactions.
- Use a variety of rules to predict the outcome of organic chemistry reactions.
- Use a variety of spectroscopic techniques to determine molecular structure.

- After completing CHEM 235, students will be able to:

- Describe the typical reactions of benzene and its derivatives. Draw reaction mechanisms.
- Summarize synthetic methods to prepare a variety of functional groups such as: aldehyde, ketone, ester, amide, anhydride, carboxylic acid, amine.
- Explain the relative acidity of carboxylic acids based on inductive and resonance effects.
- Predict the relative bacisity of a series of amines.
- Apply a variety of synthetic methods to identify the most appropriate synthetic route to obtain given organic molecules.
- Apply retrosynthesis.
- Classify carbohydrates, lipids and steroids.
- Identify structural differences among aminoacids, peptides, nucloproteins, nucleotides, nuclosides.
- Determine DNA base sequencing and describe the biological importance of DNA and RNA.

After completing CHEM 237, students will be able to:

- Identify hazardous organic materials and appropriate safe handling and disposal.
- Write scientific experimental reports on a laboratory notebook.
- Handle common microscale organic chemistry laboratory equipment,
- Determine physical properties such as boiling point, melting point, density, refractive index.
- Separate mixtures by solvent extraction and simple or fractional distillation.
- Purify samples by crystallization and sublimation techniques.

- Analyze mixtures by column chromatography and thin layer chromatography.
- Interpret infrared and nuclear magnetic resonance spectra.
- Perform single step synthesis.

After completing CHEM 238, students will be able to:

- Perform multi-step syntheses.
- Carry out Grignard reactions, aldol condensations, nucleophilic aromatic substitution reactions, ester saponification reactions.
- Identify functional groups on infrared spectra.
- Perform preliminary identification tests to several organic unknowns, carry out classification tests, prepare, purify and determine physical and infrared spectra of derivatives, analyze combined data to identify unknowns.

After completing CHEM 410, students will be able to:

- Apply the scientific method.
- Develop appreciation for the chemistry field as it applies to the biological field.
- Use chemical terminology to describe chemical processes.
- Perform simple calculations using the metric system.
- Describe radioactive chemistry: its biological effects and medical applications.
- Describe the properties of gases and perform simple calculations.
- Perform simple calculations using heat energy and caloric values.
- Analyze the factors that affect solubility.
- Describe osmosis and dialysis.
- Identify acids, bases, buffers and neutralization reactions.
- Recognize the main functional groups in organic chemistry.
- Classify carbohydrates.
- Describe the classes of lipids and their biological significance.
- Define aminoacids, peptides, proteins and enzymes. Indicate biological significance derived from chemical structural differences.

D. **Attach correlated assessment documents and relevant data:**

No assessment document available at this time.

III. Curricular offerings:

A. New, deleted, "banked" and "unbanked" in the past two years (check all that apply)

Course Prefix	Course Number	Course Title	NEW	Delete	Bank	Unbank	General Education	IGETC	AA/AS	Basic Skills	Workforce
CHEM	234	ORGANIC CHEMISTRY I	X				X	X	X		

CHEM	235	ORGANIC CHEMISTRY II	X				X	X	X		
CHEM	237	ORGANIC CHEMISTRY LABORATORY I	X				X	X	X		
CHEM	238	ORGANIC CHEMISTRY LABORATORY II	X				X	X	X		
CHEM	410	CHEMISTRY FOR HEALTH SCIENCES	X				X				

B. All current offerings except those previously identified in section A (check all that apply; attach a separate table as necessary)

Course Prefix	Course Number	Course Title	General Education	IGETC	AS/AA	Basic Skills	Workforce	Date of last revision
CHEM	100	SURVEY OF CHEMISTRY (telecourse)	X	X				CSM's
CHEM	112	CHEMISTRY IN ACTION	X	X				2002
CHEM	192	ELEMENTARY CHEMISTRY	X	X				2004
CHEM	210	GENERAL CHEMISTRY I	X	X	X			2004
CHEM	220	GENERAL CHEMISTRY II	X	X	X			2004

C. Recommended areas of curricular need based on current offerings (check all that apply; attach a separate table as necessary)

Brief Description of Course Proposed	General Ed	IGETC	AS/AA	Basic Skills	Workforce

IV. Enrollment data:

A. Weekly Student Contact Hours – WSCH /FTES
Report the 2 previous Fall semesters with the most recent on the right.

Year	2004	2005
WSCH	802	1084
FTES	26.72	36.17

B. Full time equivalent faculty count FTE and WSCH/FTE – LOAD
Report the 2 previous Fall semesters with the most recent on the right.

Year	2004	2005
FTE	1.76	2.12
LOAD	456	511

C. Retention and Success (If applicable) Report data on program retention and success rate for the past 2 Fall semesters with the most recent on the right.

Year	2004	2005
Retention	85.8	85.92
Success	69.8	84.51

D. Certificate, degree, and transfer status (If applicable) Report data on certificate, degree,

and transfer status for the past 2 years with the most recent on the right.

Year	20	20
Certificates		
Degrees		
Transfer		

E. Please comment on any trends that you see in the programs WSCH, FTES, LOAD, success and retention rates. Include factors that affect the rates and how college services are used to provide multiple avenues for student success. Include an indication of the other goals that your students have in taking your courses and how they may be meeting multiple educational goals i.e., job out, promotion, retraining etc.

Based on the enrollment data from Fall 2004 and Fall 2005 semesters given above, we can see that WSCH and FTES have experienced a 35% increase, LOAD has increased by 12%, retention remained constant and success increased by 21%. If we extend our analysis of enrollment data from Fall 2000 to Fall 2005 (See comprehensive program review self-study for data), we observe that WSCH and FTES have increased by 323%, LOAD has increased by 179%, retention has increased by 38% and success has increased by 44%. The chemistry program has experienced a continuous growth during the past four years. This is due to many factors including: the introduction of new programs of study that require chemistry as a pre-requirement such as Nursing, the introduction of the two-semester sequence of organic chemistry which is a requirement for all biology majors, the increased interaction between the program and college services such as counseling, tutoring, library, learning center and MESA program.

V. Faculty and staff hiring recommendations:

A. List full-time faculty requests and attach formal justification

Position	Areas of expertise needed
Chemistry Instructor	Organic Chemistry

A request for a full-time chemistry instructor has been submitted in Fall 2004 and Fall 2005. Budget considerations have prevented this position to be granted. Please see justification submitted in Fall 2005 in appendix C.

B. List adjunct faculty requests and attach formal justification

Position	Areas of expertise needed
None	

C. List staff requests and attach formal justification

Position	Areas of expertise needed
20 hour/week lab technician	Physical Sciences. Experience on instrumentation a plus.

No formal justification document is available at this time. Some of the reasons to request a part-time staff position are: a. The number of laboratory sessions in chemistry has gone from two to four in Fall semesters and five in Spring semesters with potential for more increases. B. The chemistry instructional aide is also responsible for Physics, Engineering, Geology, Astronomy, Electronics. 3. New specialized equipment obtained for Organic Chemistry requires a more time consuming upkeep and maintenance.

D. List professional development needs:

Training on the use of the FT-IR.
Training un updated techniques for microscale organic laboratory.

VI. Equipment and facilities recommendations:

A. List equipment, technology, materials needed in the coming year:

Item	Cost per unit
1 Refrigerator, explosive, flammable -proof	$ 3,000
1 Gas Chromatograph	$ 16.000
15 Organic laboratory micro kits	$ 300

B. List facilities needs:

New	Maintenance
Special electrical outlet for refrigerator	Air Ventilation System
Water deionizer set up	Clocks and automatic lighting
Vacuum system	Fume hoods
Air is all fume hoods	

APPENDIX C

CAÑADA COLLEGE

Chemistry Department

Fulltime Faculty Position Request

Submitted by

Jeanette Medina

October 10, 2005

Background

Traditionally, the Chemistry Department has a dual function within the College: 1) To service other scientific disciplines by providing courses that fill their individual requirements and pre-requirements. 2) To offer sufficient course work to support an Associate degree in Physical Sciences and Associate degree in Chemistry. In the Fall of 2001, there were insufficient courses offered in Chemistry to fulfill any of the two functions indicated above. The courses offered at that time were: Elementary Chemistry. CHEM 192 (a preparatory course for students who need a refresher course or have not taken a chemistry course prior to enrollment at Cañada College) and General Chemistry I (the first of a two-semester of General Chemistry sequence). Also, at that time, the Chemistry Department Faculty was comprised of two adjunct members. There was lack of direction and the chemistry program seemed to be dying. This would have negatively impacted a large number of programs. Since the Spring of 2002, the Chemistry Department has tried really hard to revive the Chemistry program. This has resulted in the addition of six new courses to our College catalog 2004-2005: Chemistry in action, CHEM 112 (chemistry for non-science majors); Organic Chemistry I, CHEM 234 (the first of a two-semester sequence); Organic Chemistry II, CHEM 235 (the second of a two-semester sequence); Organic Chemistry Laboratory I, CHEM 237 (laboratory to accompany Organic Chemistry I); Organic Chemistry laboratory II, CHEM 238 (laboratory to accompany Organic Chemistry II); and Chemistry for Health Sciences, Chem 410 (chemistry course required for the allied health science fields such as nursing, respiratory therapy, etc). In the Spring of 2006 we will have four adjunct faculty teaching the many classes now being offered. I will also teach my typical laboratory hours overload. For all of the above mentioned reasons, it is easy to conclude that no longer is possible for me alone, or even beneficial to the program, to support the tremendous growth experienced during the last three years. Most of our Chemistry classes carry a heavy load of three hours of lecture plus six hours of lab a week per class. Typically, I teach two of such courses for a total of eighteen hours a week of direct student contact. After managing my classes, writing and grading quizzes and tests, grading laboratory reports and reading-writing assignments, there is very little time for either program development or personal professional development. There are experiments to design, new techniques to implement, curricula to update, new curricula to develop, program maintenance needs, budget concerns to discern and prioritize, and just simply a much larger number of students to service with consultation, office hours, problem sessions, especial needs, letters of recommendation, etc. A new Chemistry fulltime position is badly needed so that our program can continue to fulfill the mission of the College: "…to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction in transfer and general education courses…" (mission statement taken from the current College catalog).

Justification
The justification for requesting a fulltime faculty position in chemistry will be addressed in terms of the guidelines and criteria outlined by the Office of Instruction.

A.The relationship of the position to the College's mission and goals.

- The Chemistry Fulltime position will contribute to the College's mission by allowing to provide quality instruction in a professional program by enhancing the ability to teach a larger number of courses toward the Physical Sciences Associate degree and the Associate in Chemistry degree.
- This position will address the current need of students to take Organic Chemistry courses to fulfill their requirements for transfer in a variety of Health Science related fields such as pre-medical, pre-veterinary, pre-pharmacy, physical therapy, respiratory therapy, nursing, etc as well as a variety of other programs such as chemistry, biochemistry, forensic science, etc.
- This position will assist the College in improving the quality of programs by allowing the Department to offer a more comprehensive and updated Associate degree in Chemistry and by allowing a larger number of Biology majors and other transfer students to take a larger number or required core courses at the College.
- By having an additional Fulltime Faculty in Chemistry, the department can service a larger student population in addition to expanding its course offerings to accommodate the great demand for chemistry courses by pre-professional and allied health science programs as well as part of a liberal arts program. We have observed an enhancement on student's retention with the courses that we are able to currently offer.

B. Historical quantitative data to support the request.

- Program's FTES, FTE, and LOAD (WSCH/FTE)
  Data has been extracted from the Office of Instruction Research Data for the fall semesters 2000-2004. Fall 2005 data currently available as well as spring 2006 FTE data were also compared.

	Fall 2000	Fall 2004	Fall 2005	Spring 2006	Overall increase
FTE	1.40	1.76 (+25.7%)	2.12 (+20.5%)	2.64 (+24.5%)	+ 88.6%
FTES	8.53	26.72 (+213.2%)	35.13 (+31.5%)		+ 311.9%
LOAD	183	456 (+149.2%)	497 (+9%)		+171.6%

We can see from these data that the number of students and courses offered had continuously increased from fall 2000. The number of adjunct faculty has gone from one to four but there still only one full time faculty.

C. Other programmatic need

- It is difficult to find qualified and experienced adjunct faculty. Furthermore, it is unusual for adjunct faculty to commit to work toward the growth of the program mainly due to lack of recognition and remuneration.
- Chemistry is a highly specialized discipline that requires instructors to have knowledge of theories and concepts as well as laboratory techniques, practices and, environmental and safety considerations.
- In order to continue our students' retention efforts, we must maintain our course offerings to a complete two-year curriculum to serve majors in diverse fields. We can only maintain the quality of our offerings if we have additional fulltime faculty who would contribute to the development and implementation of a revised curriculum.
- The Chemistry program relies heavily on experimental work. This requires a constant upgrading of equipment, incorporation of up-to-date laboratory experiments, revising laboratory work content, designing environmentally safer laboratories, modifying procedures to cut down the generation of hazardous waste,

etc. It is my expectation that by choosing the most qualified and experienced candidate for the fulltime position in Chemistry (if granted), a fresher point of view on laboratory management will be a reality. This will generate positive professional discussion that will translate into a higher quality of instruction for our students.

D. Program Review information

- The most recent Chemistry program review is dated 1997-1998. It was part of a more comprehensive Physical Sciences program review. At that time, there were two fulltime faculty and two adjunct faculty members within the Department experiencing a considerable decline in enrollments. It was stated that both fulltime faculty were retiring in June of 1998. It was suggested that, “replacement of one of the chemistry positions is essential to prevent further enrollment declines and to build enrollment.” Currently, we are experiencing a considerable enrollment increase but we have half the staff compared to 1998. We may think that adding several adjunct faculty could solve our staffing needs. However, having several individual entities will tend to fragment rather unify and it would not address issues such as building up and maintaining enrollments, and program and curriculum development. Furthermore, it was also suggested that without Chemistry, the enrollments in other scientific disciplines would be negatively affected since most Science/Engineering majors must take Chemistry courses.

Thank you in advance for your consideration of this request. Should you have any additional questions, please contact me at medinaj or 306-3255

ENGINEERING

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY
(2 page maximum)

Short Summary of Findings

Type your summary here:

One of the program's primary strengths is the strong academic and student support services provided by the Division's Math, Engineering, and Science Achievement (MESA) program. The Department also has strong support from the related fields of mathematics, computer science, physics and chemistry so that students with different levels of academic preparation can be admitted and be successful in the program.

The engineering faculty emphasizes the importance an active and interactive learning environment, collaborative work among students, and project-based labs. There is also a strong focus on the use of computer technology to enhance learning and improve student success through multi-media classroom demonstrations, supplemental independent computer assignments, computer simulations, and use of technology for data acquisition, processing, and report preparation. The recently acquired HP tablet pc's has enhanced the faculty's ability in using technology to enrich the students' learning experience.

The engineering curriculum at four-year institutions continues to undergo dramatic changes in rapidly changing engineering and technological fields, and Cañada's engineering program has been able to respond to these changes and keep the curriculum current. The planned renovation of the engineering/physics labs will enhance the programs ability to respond to these changes.

The program enrollment has increased considerably over the last five years. FTES increased by 135.7%, and LOAD almost tripled over the same period. The program achieved a LOAD of over 600 for the first time in Fall 2005. This is a result of the department's successful recruitment efforts that include visits to local high schools, presentations in ESL classes, and the annual Engineering Design Contest for high school students. Other contributing factors include the MESA program, modernization of computer labs, and the hiring of full-time faculty in Chemistry and Physics.

The department continues to be successful in securing external funding through grants to support the program. Most recently, a $74,000 award in equipment and cash has been received through the Hewlett-Packard Technology for Teaching grant.

Three Strengths of the Program

1. Innovative and successful use of technology in the classroom.
2. Strong academic support services from the MESA program and the Learning Center.
3. Ability to accommodate and serve students of different levels of high school preparation through a strong support from and collaboration with the related departments of mathematics, physics and chemistry.

Three Suggestions for Improvement

1. Improve schedule of class offerings; avoid three-hour lectures.
2. Update lab equipment. Build a separate Electronics lab to be shared with the Physics Department.
3. Explore distance learning to accommodate students from other community colleges that do not have an Engineering program.

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW SELF-STUDY DOCUMENT

In preparing this Program Review, keep the college mission in mind as a reminder that Program Review is to ensure that all programs are aligned with the institutional mission.

Cañada College's Mission: It is the mission of Cañada College to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction in transfer and general education courses, professional/technical programs, basic skills and activities that foster students' personal development and academic success. Cañada College accepts responsibility for serving the community's diverse needs for lifelong enrichment and highly values close teacher to student teaching and learning relationships, support services and a co-curricular environment that contributes to personal growth and success for students.

PROGRAM NAME: Engineering

PART A: Overview of Program

1. **If the program has completed a previous self-study, evaluate the progress made toward previous goals.**

Of the seven goals stated in the 1998-1999 Engineering Program Review document, significant progress has been made for the first six. The following is an itemized description of the developments since the last program review:

Goal 1: To provide rigorous and up-to-date core transfer engineering courses for students in engineering and engineering technology.

The core transfer engineering curriculum is up-to-date and is in alignment with the requirements of four-year institutions. In July 2005, Engineering instructor Amelito Enriquez attended a NSF-sponsored workshop on developing a Land Surveying/Civil Engineering Technology program. A study of the viability of developing a program at Cañada College is being currently undertaken. See Appendix E: NSF LS/CET Curriculum Conference Report.

Goal 2: To provide a complete overview of the engineering profession that students would not learn in a general education course.

ENGR 100 - Introduction to Engineering and ENGR 101 - The Engineering Profession have been developed to provide students an overview of the profession.

Significant progress has been achieved in increasing enrollment and increasing course offerings. The computer lab has been upgraded, and most computer applications programs used are reasonably current. No significant progress has been achieved in modernizing and upgrading equipment for Materials Science labs due to prohibitive costs necessary to do so.

Goal 3: To develop students' skills in critical thinking, problem solving, conducting experiments, data analysis, and written and oral communications.

Teaching pedagogy for the courses in the Department has been continually evolving to enhance the development of the above skills essential to student success in the four-year institutions and in the work place. Collaborative learning and hands-on experience have been incorporated in design projects and laboratory exercises throughout the curriculum. Recently, through a Technology for Teaching grant from Hewlette-Packard, regular use of tablet pc's during class has been incorporated and has shown to be successful in helping students develop the above mentioned skills.

Goal 4: To work closely with faculty in mathematics, computer science, and physical sciences to develop and maintain a relevant and up-to-date curriculum.
The full-time engineering instructor also teaches mathematics and therefore works closely with the rest of the Math Department as well as faculty from Computer Science and Physics in maintaining a relevant curriculum.

Goal 5: To maintain an active liaison with engineering programs in the California State University and University of California systems, as well as private colleges and universities through active involvement in the Engineering Liaison Committee.

Engineering faculty regularly attends the Fall Engineering Liaison Council meetings. Additionally, the Department has also been involved in the state wide initiatives such as the Lower-Division Transfer Pattern (LDTP) project of the CSU system, and the IMPAC project that are designed to streamline students transfer from community colleges to four-year institutions.

Goal 6: To promote the engineering profession through various outreach activities to Canada students and local area high school students.

Among the strategies employed by the Department to promote the engineering profession are the Annual Engineering Design Contest, presentations to ESL classes, First-Year Experience (FYE) students, and to high school students touring the campus. Additionally, the two engineering student organizations (Cañada Science and Engineering Club, and the Society of Professional Hispanic Engineers), and the MESA Program sponsor various events that raise awareness of the engineering profession among Cañada students, faculty and staff.

Goal 7: To provide training and retraining needed by working engineers and engineering technologists to update their skills

In the last three years, Engr 410 and 413 have not been successful in getting students to enroll. The increase in enrollment in Engr 210 has not left any room for Engr 410 and 413 students that these two courses were not offered in Fall 2005.

2. **State the goals and focus of this program and explain how the program contributes to the mission, comprehensive academic offerings, and priorities of the College and District.**

The main goal of the program is to provide lower-division preparation for students intending to transfer to four-year institutions to obtain bachalaureate degrees in various fields of engineering.

3. **If the student population has changed, state how the program is addressing these changes. Document the demographic trends.**

There is an increasing number of Hispanic students in the program, increasing from 32% of the total number of engineering students for school year 2003-2004 to about 38% for the school year 2004-2005. In response to this trend, a Cañada College chapter of the Society of Hispanic Professional Engineers (SHPE) has been established in Spring 2005.
Another trend observed is that more than half of the engineering students at the College are concurrently taking classes at other colleges incuding College of San Mateo, Skyline College, and City College of San Francisco. The results of a student survey (Appendix D) show that 20 out of 38 students (or 53%) who responded to the survey are taking courses at other colleges, 5 at both CSM and Skyline, 8 at CSM only, 7 at Skyline only, 1 at all 3 and 1 at CC only. The departments curricular offerings are planned with consultation with CSM Engineering faculty, and to some extent with Skyline Physics Department. More collaboration among the three colleges is needed in order to provide better service to the students.

4. **If the program utilizes advisory boards and/or professional organizations, describe their roles.**

The MESA Advisory Council has a big role in the Department's outreach efforts, as well as in providing student support services to the Department.

PART B: Curriculum

1. **Describe how the courses offered in the program meet the needs of the students and the relevant discipline(s). (This may be answered through narrative or quantitative evaluation).**

The Department offers all lower-division classes needed by a student intending to transfer to any CSU, UC or private institution in California.

A student survey was conducted in Fall 2005 to determine among other things how satisfied the students are in Canada's course offerings in Engineering. A summary of the results of the survey is given in Appendix D. Of the 38 students who responded to the survey 7 students (or 18 %) were very satisfied, 21 students (or 55%) were satisfied, 3 students (or 8 %) were somewhat satisfied, and 4 students (11%) were unsatisfied. Among the comments and suggestions related to course offerings were that courses be offered more than once a year. The department believes that at this point in time we do not have enough students to offer any of the courses every semester. The results of this survey indicate that the students are less satisfied with the department's course offerings than the students surveyed in Spring 1999 where 71% of the students were very satisfied and noone was not satisfied. It should be noted that in Spring 1999, Engr 210 and Engr 230 were both offered every semester.

2. **State how the program has remained current in the discipline(s).**

All courses are currently articulated with engineering departments of major universities in California.

3. **All course outlines in this program should be reviewed and, if appropriate, revised every six years. If this has not occurred, please list the courses and present a plan for completing the process.**

All course outlines have been reviewed in the last three years. Revisions of all course outlines will be done in response to the new Lower-Division Transfer Pattern (LDTP) and IMPAC course descriptions that will be coming out within the next school year.

4. **If external accreditation or certification is required, please state the certifying agency and status of the program.**

    Not applicable

5. **Describe how your program is articulated with similar departments within SMCCD, the Sequoia High School District and/or other four year institutions. (Include articulation agreements, common course numbering etc.)**

All but two of the courses offered by the Department have the same course numbers and content as those of CSM's Engineering Department. Cañada's Engr 100 is a three-unit class compared to CSM's Engr 140 that has only 1.5 units. Three units are necessary for the class to be articulated with SJSU's E10 that is required of all engineering majors. Cañada's Engr 260 (3-unit lecture class) and Engr 261 (1-unit lab class) are equivalent to CSM's Engr 260 (4-unit combined lecture and lab class). Cañada's Engr 260 and Engr 261 classes are separate because a number of 4-year institutions require only the lecture part of the class and not the lab for mechanical and civil engineering students.

6. **Discuss plans for future curricular development and/or program modification.**

Student survey results show that the following courses should be explored: MATLAB, Thermodynamics, Strength of Materials, ProEngineer. See Appendix D.

PART C: Student Outcomes

1. **Please attach all Bi-Annual State of the Department reports from the past six years.**

No Bi-Annual State of the Department reports have ever been done for this department.

2. **Update any analysis to include a summary of all years. Attach student learning outcomes here.**

    A. **Program student learning outcomes:**

Students who have completed the Engineering program at Cañada College will be able to:

1. Apply their knowledge of math, science, and engineering to identify, formulate, and solve engineering problems.
2. Design and perform experiments, analyze and interpret data, and prepare a report summarizing the results of the experiments.
3. Develop a design given a set of requirements and specifications.

4. Demonstrate professional ethical responsibility.
5. Communicate effectively and perform on multi-disciplinary teams.
6. Formulate a plan of study to obtain a Bachelor's degree in engineering and describe the processes needed to become an engineer and maintain a license.
7. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

B. **Course level student learning outcomes:**

Students who complete Engr 100 will be able to:
1. Evaluate the role of engineers in various societies around the world and throughout history.
2. recommend the types of projects and responsibilities that are the most appropriate for various engineering disciplines.
3. formulate and perform elementary engineering calculations to aid the selection of the best design for a simple device.
4. read and write elementary engineering drawings, instructions, and reports.
5. perform experiments analyze and interpret data, and prepare a report summarizing the results of the experiments.
6. illustrate the processes required to become an engineer and maintain a license.
7. explain and analyze ethical issues in engineering.

Students who complete Engr 210 will be able to:
1. Read engineering drawings.
2. Distinguish between various types of projections used in engineering drawings.
3. Make freehand drawings.
4. Demonstrate the use of drawing instruments.
5. Demonstrate the use of CAD programs, including solid modeling.
6. Specify dimensions and tolerances in engineering graphics.
7. Adhere to the standard conventions for terminology, symbols, and styles used in engineering graphics.

Students who complete Engr 230 will be able to:
1. Reduce systems of forces to one force or one force and one couple.
2. Solve for unknown forces for rigid bodies in two-dimensional and three-dimensional equilibrium. 3. Analyze trusses, frames, and machines for external reaction forces and forces between the members.
4. Calculate centroids and moments of inertia for composite bodies.
5. Solve for internal forces in members and construct shear and bending moment diagrams for beams.
6. Solve problems that include friction.
7. Analyze the stability of rigid bodies in equilibrium.

Students who complete Engr 270 will be able to:
1. Identify the crystalline structure of models, and explain now the structure's characteristics affect a material's properties.

2. Distinguish between the types of imperfections that can occur in crystalline structures and compare their effects on a material's properties.
3. Calculate rates of steady-state diffusion.
4. Perform tension, compression, and hardness tests, and interpret the results.
5. Describe different strengthening mechanisms and thermal processing, and compare their effects.
6. Relate typical properties of polymers and ceramics to their structures.
7. Describe the mechanisms for electrical conduction in semiconductors.

Students who complete Engr 260 will be able to:
1. Analyze electric circuits for DC, transient, and AC voltage and current responses,
2. Evaluate different circuits analysis techniques and choose an appropriate technique for a particular circuit,
3. Apply a simple model for operational amplifiers to solve simple circuits,
4. Use multimeters, signal generators, and oscilloscopes,
5. Calculate power in DC and AC circuits (using the concepts of complex power),
6. Analyze Y-Y connected balanced three phase circuits,
7. Use a circuits simulation program (PSPICE, MultiSIM) to predict circuit behavior.

PART D: Faculty and Staff

1. List current faculty and staff members in the program, areas of expertise, and how positions contribute to the program success.

Amelito Enriquez has developed and updated the engineering curriculum at the College, and has taught all the engineering courses that are offered by the Department. He keeps up to date with the requirements of engineering programs in four-year schools by actively participating in the Engineering Liaison Council. In the last several years, he has been successful in obtaining external funding through grants to supplement the Department's budget in order to make the curriculum current.
Babak Darafshi has recently started teaching Engineering 100. He has many years of industry experience that is valuable in an introductory class.
Lili Lazar has been an Instructional Aide resposible for ordering laboratory supplies and maintaining lab equipment.

2. List major professional development activities completed by faculty and staff in this program in the last six years and state what development is needed or proposed by faculty in this program.

Amelito Enriquez attended the following conferences over the last several years:
- One of 6 invited presentations at the 2006 HP/International Society for Technology in Education
- Poster Presentation: "Most Convincing Evidence of Impact" Award at the 2006 HP/International - Society for Technology in Education
- Annual Engineering Liaison Council Meeting, Fall 2000-2005
- NSF/SJCC - Developing a Civil Engineering Technology Curriculum - July 2005
- Lower-Division Transfer Pattern Conference - February 2005
- CMC3 Fall Conference - 2004
- HP Engineering Projects in the Community Symposium (EPICS) - 2004

- Served as a reviewer for Journal of Geophysical Research - 2003
- HP Engineering Retention Symposium 2003
- Materials Research Society Syposium Fellowship- 2002

3. Describe the departmental orientation process for new full-time and adjunct faculty and staff (please include student workers such as tutors and aides).

The Science and Technology Division has a very active and well-functioning mentoring program for faculty. Every new faculty is assigned a departmental mentor who is available as a resource, for classroom visits, and to help in becoming knowledgeable about departmental policies and procedures.

PART E: Facilities, Equipment, Materials and Maintenance

1. Discuss the quality and accessibility of the facilities, equipment, equipment maintenance, and materials available to the program. List projected needs.

An area of concern with respect to laboratory equipment is Materials Science and Engineering. Many of the pieces of expensive equipment used for this class are old, and have not undergone maintenance for extended periods of time. Replacing some of them will require considerable amounts of money, although a few new ones have been recently purchased using funds from various grants.

2. Describe the use and currency of technology. List projected needs.

The use of technology in the classroom has been one of the strengths of the Department. Currently, there are two computer labs available to the Department faculty and students. The computer lab in 16-110 has been used during lectures and lab sessions for Graphics, and Introduction to Engineering, and by students to do homework and prepare lab reports during Open Lab Hours. The recently acquired HP tablet pc's are being used during lectures and labs for Statics, Materials Science, Dynamics and Circuits.
For each engineering course, a course webpage is available and includes student access to class materials, lecture notes, dicussion boards, and grades through Gradekeeper. Computerized course materials such as (COSMOS and ARIS) provided by textbook publishers are also being utilized. During lectures and labs, presentations software such as PowerPoint and Classroom Presenter are being used, as well as applications such as NetSupport School and Discourse in order to enhance classroom interaction. Content-specific applications such as AutoCAD and Electronics Workbench are also being used to enhance student learning.
One area of concern regarding technology is the cost of keeping up with up-to-date computer applications that are necessary for our students competitive in four-year schools as well as in the job environment. AutoCAD and Electronics Workbench require expensive yearly upgrades. Additionally, an area of emerging importance in engineering is parametric modeling that will require additional software such as Pro/Engineer or Solidworks.

3. If applicable, describe the support the program receives from industry. If the support is not adequate, what is necessary to improve that support?

The Department has been successful in securing external funding through grants. Hewlett-Packard has provided the Department with funds and equipment through the Silicon-Valley Grants and the HP Technology for Teaching grant. Practicing engineers around the local area have also participated in various activities including the Engineering Lecture Series, and presentations on special topics of interest to students in specific courses.

PART F: Budget Request

1. **What faculty positions will be needed in the next six years in order to maintain or build the department?**

Adjunt Faculty in Intro to Engineering, and Surveying (if the department decides to start offering this class).

2. **What staff positions will be needed in the next six years in order to maintain or build the department? (Staff, facilities, equipment and/or supplies) will be needed in the next six years?**

50% Instructional Aide to be shared with the Physics department

3. **What equipment will be needed in the next six years in order to maintain or build the department?**

Materials Science Equipment:
- Charpy Impact Tester
- Rockwell hardness tester
- Tensile Tester
- Surveying equipment (Total Stations, GPS)

4. **What facilities will be needed in the next six years in order to maintain or build the department?**

A separate Electronics Lab to be shared with the Physics department. Currently, the laboratory room in Builing 16, Room 106 is being used by the following courses: Engr 100, Engr 261, Engr 270, Phys 210, Phys 220, Phys 250, Phys 260, Phys 270, and Astro 101. A separate electronics lab in 16-108 will accommodate Engr 261, Phys 220 and Phys 260, making scheduling easier and more convenient for students.

PART G: Additional Information

1. **Describe any other pertinent information about the program that these questions did not address?**

CAÑADA COLLEGE
BI-ANNUAL STATE OF THE DEPARTMENT
DATA COLLECTION DOCUMENT

Program Name:

I. Program goals and objectives:

Goal 1: To provide rigorous and up-to-date core transfer engineering courses for students in engineering and engineering technology.

Goal 2: To provide a complete overview of the engineering profession that students would not learn in a general education course.

Goal 3: To develop students' skills in critical thinking, problem solving, conducting experiments, data analysis, and written and oral communications.

Goal 4: To work closely with faculty in mathematics, computer science, and physical sciences to develop and maintain a relevant and up-to-date curriculum.

Goal 5: To maintain an active liaison with engineering programs in the California State University and University of California systems, as well as private colleges and universities through active involvement in the Engineering Liaison Committee.

Goal 6: To promote the engineering profession through various outreach activities to Canada students and local area high school students.

Goal 7: To provide an enriching educational and social experience to engineering students through co-curricular and extra-curricular activities.

II. Student Learning Outcomes:

C. **List all identified program student learning outcomes:**

Students who have completed the Engineering program at Cañada College will be able to:

8. Apply their knowledge of math, science, and engineering to identify, formulate, and solve engineering problems.
9. Design and perform experiments, analyze and interpret data, and prepare a report summarizing the results of the experiments.
10. Develop a design given a set of requirements and specifications.
11. Demonstrate professional ethical responsibility.
12. Communicate effectively and perform on multi-disciplinary teams.
13. Formulate a plan of study to obtain a Bachelor's degree in engineering and describe the processes needed to become an engineer and maintain a license.
14. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

D. **Attach correlated assessment tools and relevant data:**

No assessment tools or data available.

E. **List a sample of course level student learning outcomes:**

Students who complete Engr 100 will be able to:
8. evaluate the role of engineers in various societies around the world and throughout history.
9. recommend the types of projects and responsibilities that are the most appropriate for various engineering disciplines.
10. formulate and perform elementary engineering calculations to aid the selection of the best design for a simple device.
11. read and write elementary engineering drawings, instructions, and reports.
12. perform experiments analyze and interpret data, and prepare a report summarizing the results of the experiments.
13. illustrate the processes required to become an engineer and maintain a license.
14. explain and analyze ethical issues in engineering.

Students who complete Engr 210 will be able to:
8. Read engineering drawings.
9. Distinguish between various types of projections used in engineering drawings.
10. Make freehand drawings.
11. Demonstrate the use of drawing instruments.
12. Demonstrate the use of CAD programs, including solid modeling.
13. Specify dimensions and tolerances in engineering graphics.
14. Adhere to the standard conventions for terminology, symbols, and styles used in engineering graphics.

Students who complete Engr 230 will be able to:
1. Reduce systems of forces to one force or one force and one couple.
2. Solve for unknown forces for rigid bodies in two-dimensional and three-dimensional equilibrium. Analyze trusses, frames, and machines for external reaction forces and forces between the members.
4. Calculate centroids and moments of inertia for composite bodies.
5. Solve for internal forces in members and construct shear and bending moment diagrams for beams.
6. Solve problems that include friction.
7. Analyze the stability of rigid bodies in equilibrium.

Students who complete Engr 270 will be able to:
1. Identify the crystalline structure of models, and explain now the structure's characteristics affect a material's properties.
2. Distinguish between the types of imperfections that can occur in crystalline structures and compare their effects on a material's properties.
3. Calculate rates of steady-state diffusion.
4. Perform tension, compression, and hardness tests, and interpret the results.
5. Describe different strengthening mechanisms and thermal processing, and compare their effects.
6. Relate typical properties of polymers and ceramics to their structures.
7. Describe the mechanisms for electrical conduction in semiconductors.

Students who complete Engr 260 will be able to:
1. Analyze electric circuits for DC, transient, and AC voltage and current responses,
2. Evaluate different circuits analysis techniques and choose an appropriate technique for a particular circuit,
3. Apply a simple model for operational amplifiers to solve simple circuits,
4. Use multimeters, signal generators, and oscilloscopes,
5. Calculate power in DC and AC circuits (using the concepts of complex power),
6. Analyze Y-Y connected balanced three phase circuits,
7. Use a circuits simulation program (PSPICE, MultiSIM) to predict circuit behavior.

F. **Attach correlated assessment documents and relevant data:**

No assessment documents and data available.

III. Curricular offerings:

A. New, deleted, "banked" and "unbanked" in the past two years (check all that apply)

Course Prefix	Course Number	Course Title	NEW	Delete	Bank	Unbank	General Education	IGETC	AA/AS	Basic Skills	Workforce
Engr	410	Computer-Aided Graphics		X							
Engr	413	Designing with CAD		X							

B. All current offerings except those previously identified in section A (check all that apply; attach a separate table as necessary)

Course Prefix	Course Number	Course Title	General Education	IGETC	AS/AA	Basic Skills	Workforce	Date of last revision
Engr	100	Introduction to Engineering			X			9/13/02
Engr	101	The Engineering Profession			X			9/15/03
Engr	210	Engineering Graphics			X			3/23/03
Engr	230	Statics			X			3/23/03
Engr	240	Engineering Dynamics			X			3/23/03
Engr	260	Circuits and Devices			X			3/23/03
Engr	261	Circuits and Devices Lab			X			3/23/03
Engr	270	Materials Science and Engineering			X			3/23/03

C. Recommended areas of curricular need based on current offerings (check all that apply; attach a separate table as necessary)

Brief Description of Course Proposed	General Ed	IGETC	AS/AA	Basic Skills	Workforce
Surveying - First course in surveying for Civil Engineers			X		

IV. Enrollment data:

A. Weekly Student Contact Hours – WSCH /FTES
Report the 2 previous Fall semesters with the most recent on the right.

Year	2004	2005
WSCH	383	502
FTES	12.77	16.737

B. Full time equivalent faculty count FTE and WSCH/FTE – LOAD
Report the 2 previous Fall semesters with the most recent on the right.

Year	2004	2005
FTE	0.79	0.81
LOAD	485	620

C. Retention and Success (If applicable) Report data on program retention and success rate for the past 2 Fall semesters with the most recent on the right.

Year	2004	2005
Retention	85.7%	93.2%
Success	85.7%	87.7%

D. Certificate, degree, and transfer status (If applicable) Report data on certificate, degree, and transfer status for the past 2 years with the most recent on the right.

Year	2004	2005
Certificates		
Degrees		
Transfer		

E. Please comment on any trends that you see in the programs WSCH, FTES, LOAD, success and retention rates. Include factors that affect the rates and how college services are used to provide multiple avenues for student success. Include an indication of the other goals that your students have in taking your courses and how they may be meeting multiple educational goals i.e., job out, promotion, retraining etc.
From Fall 2000 to Fall 2005 the WSCH and FTES increased by 135.7%, and the LOAD by 144.4%, while the FTE has decreased slightly by 3.6%. The LOAD has been increasing steadily every year over the period, while the WSCH and FTES have been increasing every year except in 2003.

Retention has increased over the last five years by 34.3%, and success by 45.0%. The biggest change in retention and success occurred in 2001, and since then, retention has been more steady at around 85-90% while the success rate has been only a few percentage points lower than the retention rate.

V. Faculty and staff hiring recommendations:

A. List full-time faculty requests and attach formal justification

Position	Areas of expertise needed
none	

B. List adjunct faculty requests and attach formal justification

Position	Areas of expertise needed
none	

C. List staff requests and attach formal justification

Position	Areas of expertise needed
none	

D. List professional development needs:

Training on ProE since four-year engineering school are now starting to require Mechanical and Civil Engineering students to learn this program.

VI. Equipment and facilities recommendations:

A. List equipment, technology, materials needed in the coming year:

Item	Cost per unit
1 - Charpy Impact tester	$10,000
1 - Rockwell Hardness tester	$3,500
25 - AutoCAD 2007 upgrade	$400

B. List facilities needs:

New	Maintenance
A separate Electronics Lab to shared with Physics	
Renovation of 16-106 and 16-108	
Storage space for bulky lab equipment	

Appendix E

NSF LS/CET Curriculum Conference
Evergreen Valley College
July 11-15, 2005

General Comments:

- The curriculum presented is on Land Surveying Certificate and A.S. degree programs only. Evergreen College does not have a comprehensive Civil Engineering Technology (CET) program.
- The curriculum does not prepare students for transfer to a 4-year school for a BS.
- Evergreen's LS program has been in place, and has not been doing well. The updated curriculum includes three new technologies: GPS (Global Positioning System), GIS (Geographic Information System), and LDD (Land Development Desktop). Implementation of the curriculum started last fall 2004 with a cohort of 17 students.
- The new Land Surveying curriculum is up-to-date, and can be adopted at Canada with minor changes.

What should we do at Cañada?

I see three different options on what should be done at Cañada with regards to a LS/CET program:

A. Develop a comprehensive CET program that includes Land Surveying, Structural, Environmental, Geotechnical, and other areas of CET.
B. Develop a Land Surveying program similar to Evergreen's.
C. Develop a transferable surveying class for Civil Engineering students.

Options A, or B cannot be done without external funding sources. Evergreen's update of their Land Surveying curriculum to include the three new technologies cost about $150K, and was funded through a combination of an NSF grant, and partnerships with Trimble for GPS equipment and training, and ESRI for GIS software and training.
Option C will cost $10K-$20K in equipment for "total stations," and considerably more if GPS surveying is included in the curriculum.

What needs to be done next?

Although the team from Evergreen Valley College did a thorough job in getting input from the industry on future demand for land surveyors, I am not completely convinced that our service area would be able to support a successful CET program. Over the next few months, I will investigate existing 2-year and 4-year Civil Engineering Technology programs in California, as well as the entire US to determine which of the three options is best for our Cañada.

Appendix E
Engineering Survey—Fall 2005

Please respond to all questions – be assured that your responses will remain confidential. This survey will be used for /program review purposes only.

1. What is your educational level?
   38-- AA/AS Degree, 2 years college, or less __ BA or BS degree __ Master's or higher

2. How many of college units you are taking this semester? (Include courses in other colleges.)
   1__ Less than *5* units 6__ 6 -11 units 31__ 12 units or more

3. What is your purpose in taking this class?
   3__ Earn an AA/AS degree 36__ Transfer to a 4-year school for a BS degree
   3__ Enhance or gain new job skills 4__ Personal enrichment

4. Which Engineering course/s have you taken at Cañada? Check all those that apply.
   4_ Engr 100 (Intro) 30_ Engr 210 (Graphics) 17_ Engr 230 (Statics)
   13 Engr 240 (Dynamics) 6_ Engr 260 (Circuits) 6_ Engr 261 (Circuits Lab)
   25 Engr 270 (Materials Science)

5. Please check those Cañada courses you are interested in taking.
   25 Engr 100 (Intro) 4_ Engr 210 (Graphics) 9_ Engr 230 (Statics)
   19 Engr 240 (Dynamics) 27 Engr 260 (Circuits) 23 Engr 261 (Circuits Lab)
   6_ Engr 270 (Materials Sci) 10 Engr 215 (MATLAB)

6. What other engineering courses would you like taught? Check all that apply.
   14 MATLAB 6 Surveying 9_ ProEngineer 10 Strength of Materials
   16 Thermodynamics __ Others: Please specify ____________

7. Are you taking courses in other colleges? 20_ yes 18_ no (If "no", go to question #11.)

8. Check all other colleges/universities you are currently attending.
   14 CSM 13 Skyline __ Foothill
   __ de Anza 2_ City College of SF __ Others: Please specify ______

9. Please check courses you are taking in colleges/universities specified in number 8.
   7_ Engineering 4_ Physics 2_ Chemistry 7_ Mathematics
   6_ Programming 5_ General Ed 1_ Others: Please specify ______________

10. What is your primary reason for taking courses in colleges other than Cañada?
    13 Schedule 3_ Course not offered in Cañada __ Better college
    3_ Better offering 3_ Instructor __ Better facilities
    6_ Close to home __ Others: Please specify ______________

11. Thinking of the Engineering Program only at Cañada College, how satisfied are you with …

a) Frequency of course offerings? (Fall: Engr 210, 240 & 270; Spring: Engr 100, 230 & 260/261)
   7_ Very satisfied 21 Satisfied 6_ Somewhat satisfied 4_ Not satisfied

b) Days of the week and times of the day courses are offered?
   5_ Very satisfied 15 Satisfied 12 Somewhat satisfied 5_ Not satisfied

c) Availability and quality of laboratory equipment?
   3_ Very satisfied 8_ Satisfied 13_ Somewhat satisfied 13_ Not satisfied

If you selected "Not satisfied" for any of the above, please briefly explain why:

PHYSICS

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW EXECUTIVE SUMMARY

(2 page maximum)

Short Summary of Findings

Type your summary here:

The Physics Department continues to prepare students for successful transfer to four-year institutions, to provide the prerequisite foundation in physics for further work in engineering and the sciences, to foster critical thinking and active learning, and to fulfll the needs and interests of students by having a well rounded curriculum of lecture and laboratories. The physics program should endeavor to grow by introducing preparatory courses in problem solving skills and a fourth semester of general physics with calculus. Also, new methods of instruction utilizing active learning techniques should continue to be studied and developed. While success and retention are fairly high, more should be done to reach out to the population of college students that normally avoid physics in particular and the sciences in general.

Three Strengths of the Program

1. *Flexibility to serve students in the engineering and chemistry programs.*

2. *Most of the students are transfer and fulltime.*

3. *Supportive environment coupled with MESA to help students succeed.*

Three Suggestions for Improvement

1. *Better coordinated out-of-class study time for students*

2. *Introductory 1 unit class in physics problem solving*

3. *More versatility in the lecture/demonstration setup*

CAÑADA COLLEGE
COMPREHENSIVE PROGRAM REVIEW SELF-STUDY DOCUMENT

In preparing this Program Review, keep the college mission in mind as a reminder that Program Review is to ensure that all programs are aligned with the institutional mission.

Cañada College's Mission: It is the mission of Cañada College to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction in transfer and general education courses, professional/technical programs, basic skills and activities that foster students' personal development and academic success. Cañada College accepts responsibility for serving the community's diverse needs for lifelong enrichment and highly values close teacher to student teaching and learning relationships, support services and a co-curricular environment that contributes to personal growth and success for students.

PROGRAM NAME: Physics

PART A: Overview of Program

1. **If the program has completed a previous self-study, evaluate the progress made toward previous goals.**

Among the previous goals were increasing appreciation and comprehension of physical phenomena, physical laws and the scientific method. This will, of course, be perennial goal. What is new and in progress is the use of student learning outcomes to assess this progress.

2. **State the goals and focus of this program and explain how the program contributes to the mission, comprehensive academic offerings, and priorities of the College and District.**

The Physics Department endeavors to prepare students for successful transfer to four-year institutions, to provide the prerequisite foundation in physics for further work in engineering and the sciences, to foster critical thinking and active learning, and to fulfll the needs and interests of students by having a well rounded curriculum of lecture and laboratories.

3. **If the student population has changed, state how the program is addressing these changes. Document the demographic trends.**

The demographics have not changed significantly in the last 6 years, the male/female ratio over all physics classes are:

Fall 2003 Male/Female = 61%/39% Spring 2004 57%/43%
Fall 2004 Male/Female = 46%/54% Spring 2005 56%/44%

However, the calculus sequence is still approximately 80% male. In terms of ethnicity, the breakdown remains largely constant. This ethnic makeup is probably different than the college as overall. This demonstrates a need to provide better access and support for underrepresented students.

Ethnicity	F2003	Sp2004	F2004	Sp2005
Asian	28%	11%	25%	21%
African American	4%	4%	1%	2%
Filipino	13%	5%	4%	4%
Hispanic	20%	34%	18%	27%
Native American	1%			
Other	1%			2%
White	29%	39%	39%	29%
Unknown	3%	7%	12%	15%

4. **If the program utilizes advisory boards and/or professional organizations, describe their roles.**

   N/A The program does not use advisory boards.

PART B: Curriculum

1. **Describe how the courses offered in the program meet the needs of the students and the relevant discipline(s). (This may be answered through narrative or quantitative evaluation).**

The calculus based sequence (PHYS 250-260-270) meets the need of the physical science and engeering students as a reqired core curriculum. The algebra based sequence (PHYS 210-220) also meets the needs of required core currculum and also serves a GE credit. PHYS 405 is a required course in the radiation technology program.

2. **State how the program has remained current in the discipline(s).**

The curriculum in these courses has not changed much in the last 50 years, however, many new and interesting ways of motivating the student to interact with the material have developed. These courses make extensive use of online facilites offered through the publisher. These include self-tutoring homework and other online study aids.

3. **All course outlines in this program should be reviewed and, if appropriate, revised every six years. If this has not occurred, please list the courses and present a plan for completing the process.**

All courses have been reviewed within the last six years

4. **If external accreditation or certification is required, please state the certifying agency and status of the program.**

   N/A

5. **Describe how your program is articulated with similar departments within SMCCD, the Sequoia High School District and/or other four-year institutions. (Include articulation agreements, common course numbering etc.)**

Articulation agreements exist with SFSU, SJSU, UCBerkeley, UC Davis for both the physics with calculus sequence (Phys 250,260, 270) and the algebra sequence (Phys 210, 220)

6. **Discuss plans for future curricular development and/or program modification.**

A one unit course in problem solving for general physics would be a useful course to offer for underprepared students. Also, there is a need to offer a fourth semester of calculus based physics as some colleges are now requiring a fourth semester.

PART C: Student Outcomes

1. **Please attach all Bi-Annual State of the Department reports from the past six years.**

   See attached

2. **Update any analysis to include a summary of all years. Attach student learning outcomes here.**

   See attached

PART D: Faculty and Staff

1. **List current faculty and staff members in the program, areas of expertise, and how positions contribute to the program success.**

   Dr. Martin D. Partlan - General Physics

2. **List major professional development activities completed by faculty and staff in this program in the last six years and state what development is needed or proposed by faculty in this program.**

No major professional development activities. What is needed is traning in effective use of group activites and group activites involving the use of computers.

3. **Describe the departmental orientation process for new full-time and adjunct faculty and staff (please include student workers such as tutors and aides).**

For faculty members there is no formal process. This should be developed. Student tutors are managed through the MESA program.

PART E: Facilities, Equipment, Materials and Maintenance

1. **Discuss the quality and accessibility of the facilities, equipment, equipment maintenance, and materials available to the program. List projected needs.**

The lecture/lab room 16-106 is in serious need of renovation. Recant bond measures have allowed the science division faculty to develop plans for the renovation. The renovations are expected to be implemented within the next two years. These plans include modernizing the lab furniture and a new lecture/lab room in the existing storage room (16-108).

2. **Describe the use and currency of technology. List projected needs.**

Some of the labs use computer based data acquisition systems. The renovation plans include eight new wireless laptops for this purpose. All labs make extensive use of computers for data analysis and presentation. Many students now have their own computers for this purpose; however, there are many computer facilities on campus (16-110, MESA, Learning Center) available to the students.

3. **If applicable, describe the support the program receives from industry. If the support is not adequate, what is necessary to improve that support?**

The Physics program receives no direct support from industry. However, the physical sciences do receive grants for technology from HP.

PART F: Budget Request

1. **What faculty positions will be needed in the next six years in order to maintain or build the department?**
   1 adjunct and 1 sabbatical replacement.

2. **What staff positions will be needed in the next six years in order to maintain or build the department? (Staff, facilities, equipment and/or supplies) will be needed in the next six years?**

The physics program gets assistance from the chemistry stockroom person. The current person may retire in the next six years.

3. **What equipment will be needed in the next six years in order to maintain or build the department?**

New lab equipment to update the modern physics experiments. No specific equipment has yet been chosen.

4. **What facilities will be needed in the next six years in order to maintain or build the department?**
   New lecture/lab room as part of the bond renovation project.

PART G: Additional Information

1. **Describe any other pertinent information about the program that these questions did not address?**
   Nothing to add

CAÑADA COLLEGE
BI-ANNUAL STATE OF THE DEPARTMENT
DATA COLLECTION DOCUMENT

Program Name: *Physics*

I. Program goals and objectives:

Among the previous goals were increasing appreciation and comprehension of physical phenomena, physical laws and the scientific method. This will, of course, be perennial goal. What is new and in progress is the use of student learning outcomes to assess this progress.

II. Student Learning Outcomes:

A. **List all identified program student learning outcomes:**

No program student learning outcomes have been identified yet

B. **Attach correlated assessment tools and relevant data:**

C. **List a sample of course level student learning outcomes:**

Physics 250	Vector Operations	Be able to identify and work with vector quantities
	Energy Conservation	Be able to use the concept of energy conservation in solving problems and be able to identify when energy is conserved and when it is not.

D. **Attach correlated assessment documents and relevant data:**

See appendix G.

III. Curricular offerings:

A. New, deleted, "banked" and "unbanked" in the past two years (check all that apply)

Course Prefix	Course Number	Course Title	NEW	Delete	Bank	Unbank	General Education	IGETC	AA/AS	Basic Skills	Workforce
		None									

B. All current offerings except those previously identified in section A (check all that apply; attach a separate table as necessary)

Course Prefix	Course Number	Course Title	General Education	IGETC	AS/AA	Basic Skills	Workforce	Date of last revision
PHYS	210	General Physics I	X	X	X			
PHYS	220	General Physics II	X	X	X			
PHYS	250	General Physics with Calculus I	X	X	X			
PHYS	260	General Physics with Calculus I	X	X	X			
PHYS	270	General Physics with Calculus I	X	X	X			
PHYS	405	Radiation Technologist Physics	X				X	

C. Recommended areas of curricular need based on current offerings (check all that apply; attach a separate table as necessary)

Brief Description of Course Proposed	General Ed	IGETC	AS/AA	Basic Skills	Workforce

IV. Enrollment data:

A. Weekly Student Contact Hours – WSCH /FTES
Report the 2 previous Fall semesters with the most recent on the right.

Year	2003	2004	2005
WSCH	444	431	583
FTES	14.8	14.37	19.43

B. Full time equivalent faculty count FTE and WSCH/FTE – LOAD
Report the 2 previous Fall semesters with the most recent on the right.

Year	2003	2004	2005
FTE	1.28	1.28	1.28
LOAD	347	337	455

C. Retention and Success (If applicable) Report data on program retention and success rate for the past 2 Fall semesters with the most recent on the right.

Year	2003	2004	2005
Retention	75%	83.1%	
Success	72.1%	80%	

D. Certificate, degree, and transfer status (If applicable) Report data on certificate, degree, and transfer status for the past 2 years with the most recent on the right.

Year	2003	2004
Certificates	0	0
Degrees	0	0
Transfer		

E. Please comment on any trends that you see in the programs WSCH, FTES, LOAD, success and retention rates. Include factors that affect the rates and how college services are used to provide multiple avenues for student success. Include an indication of the other goals that your students have in taking your courses and how they may be meeting multiple educational goals i.e., job out, promotion, retraining etc.

The interesting trend is that we have a large fraction of our calculus based physics students have taken the first course in the sequence at a different institution. Unknown exactly what this means except that they seem to prefer to complete their science programs at Cañada. The trend in the algebra sequence is toward increasing enrollment. 2005-06 will be the first year with full sections of PHYS 210 and 220.

V. Faculty and staff hiring recommendations:

A. List full-time faculty requests and attach formal justification

Position	Areas of expertise needed
None	

B. List adjunct faculty requests and attach formal justification

Position	Areas of expertise needed
Physics Instructor	General Physics

Sabbatical Replacement and/or to allow the development of additional courses such as a problem solving skills development course and a fourth semester of general physics with calculus.

C. List staff requests and attach formal justification

Position	Areas of expertise needed

D. List professional development needs:

VI. Equipment and facilities recommendations:

A. List equipment, technology, materials needed in the coming year:

Item	Cost per unit
See appendix F	

B. List facilities needs:

New	Maintenance
None	

Retention and Success

RETENTION & SUCCESS IN PHYSICS BY ETHNICITY & SUBJECT

Physics	Data	Am. Indi	Asian	Black	Hispanic	Other	White	(blar	Grand Total
2003	RETENTION	100%	79%	67%	77%	100%	90%		81%
	SUCCESS	100%	69%	67%	69%	100%	80%		72%
2004	RETENTION	83%	100%	82%	67%	100%	84%		83%
	SUCCESS	79%	100%	82%	67%	100%	80%		80%
2005	RETENTION	100%	86%	100%	92%	100%	85%		89%
	SUCCESS	100%	86%	100%	83%	100%	85%		86%

RETENTION & SUCCESS BY GENDER & SUBJECT IN FALL

Physics	Data	Female	Male	N	(blank)	Grand Total
2003	RETENTION	85%	80%			81%
	SUCCESS	77%	71%			72%
2004	RETENTION	89%	76%			83%
	SUCCESS	86%	72%			80%
2005	RETENTION	94%	86%			88%
	SUCCESS	91%	84%			86%

Appendix F: **Equipment List**

Physics Equipment List
March 20-2006

			Each	Quantity	Total		
Current Balance Set	Sarget Welch	WL2339	115.89	4	$	463.56	
Electron Beam Tube	Sarget Welch	CP71266-00	751.99	2	$	1,503.98	
Wire set	PASCO	SE7123	25	6	$	150.00	Received
Ring Launcher	PASCO	EM8661	299	1	$	299.00	
Ring Launcher Accs.	PASCO	EM8662	99	1	$	99.00	
Charge & Discharge	PASCO	EM8678	99	6	$	594.00	
RLC Circuits	PASCO	CL6512	89	6	$	534.00	Received
Thermal Expanssion	PASCO	TD8558A	399	6	$	2,394.00	Received
Student Bell Jar	PASCO	SE9790	35	2	$	70.00	Received
Energy Transfer	PASCO	ET8499	59	6	$	354.00	Received
Radiation Cube	PASCO	TD8554A	359	3	$	1,077.00	Received
Radiation Sensor	PASCO	TD8553	199	3	$	597.00	Received
Stefan-Boltzman Lamp	PASCO	TD8555	45	3	$	135.00	Received
Basic Calorimeter	PASCO	TD8557	79	4	$	316.00	Received
Multimeter	PASCO	SE9786A	45	12	$	540.00	Received
Optics System	PASCO	OS8546A	949	6	$	5,694.00	
Power Supply	PASCO	SE9720A	299	12	$	3,588.00	
Mercury Vapor Tubes	Sargent Welch	WLS-D-6875	39.11	6	$	234.66	Received
Diffraction Gratings	PASCO	OS-9127	25	4	$	100.00	Received
				Total	$	18,743.20	

Appendix G

Correlated assessment documents and relevant data:

Breakdown of assessment tools:

1) Quiz 1: Vector dot product
2) Exam 1: Questions: 1,4,6,8,9 require an understanding of vector relationships
3) Quiz 2: Requires an understanding of vector relationships.
4) Exam 2: Questions: 3, 4, 5, 6 require an understanding of vector relationships
5) Quiz 3: Requires an understanding of energy conservation.

At the time of this writing, Quiz 3 is the only assessment I have of their average understanding of energy conservation. This number is: 63%. During the remaining part of the semester we will see if the average understanding of energy conservation increases.

My observations about the assessment process is that at this point my tools are too crude but the concept of developing assessment tools and specific learning objectives seems to be good.

Below are the tabulated data for each student and the specific exams and quizzes follow.

			Understanding of vectors											Energy
Student Name			Quiz 1	Ex1-1	Ex1-4	Ex1-6	Ex-8	Ex1-9	Quiz 2	Ex2-3	Ex2-4	Ex2-5	Ex2-6	Quiz 3
1			10	10	7	10	10	5	10	10	10	10	10	9
2			10	10	9	9	10	5	7	7	6	7	2	4
3			6	10	10	10	10	10	8	6	10	10	10	5
4														
5			6	10	0	0	0	0	7	7	2	2	0	7
6			0	5	0	10	0	0	6	10	8	10	10	
7									4					
8			0	0	0	10	9	10	7	10	3	6	10	7
9			10	10	0	10	0	0	8	5	1	10	10	6
10			8	10	9	10	10	10	6	10	10	10	10	5
11			10	10	3	5	3	0	6	10	10	10	10	4
12			10	10	9	10	10	5	8	10	10	10	10	8
13			0	5	0	0	5	0	4	0	1	2	2	
14			10	10	7	10	10	5	5	5	8	6	10	8
Sum			80	100	54	94	77	50	86	90	79	93	94	63
Percent			67%	83%	45%	78%	64%	42%	72%	75%	66%	78%	78%	63%
			Quiz 1		67%									
Average			Exam 1		63%									
			Quiz 2		72%									
Average			Exam 2		74%									
			Quiz 3		63%									

Appendix H

Geology and Oceanography

Cañada College offers one course in Geology; Geological Hazards, and one course in Oceanography. Enrollments fluctuate from term to term although there is a trend towards declining enrollments in Geology and enrollments in Oceanography have increased. There have been no significant changes in the demographics of students enrolled in Geology but the age of students enrolled in Oceanography has changed with more under the age of 18 enrolled. This is due to the fact that we offered a section of Oceanography as part of our "Cañada at Carlmont" program and 19 high school juniors and seniors enrolled in this course.

The reasons for declining enrollments have been explored and alterations in scheduling and in the curriculum are being implemented for the Fall 2006 semester. A one unit Oceanography lab course has been developed which, when taken with the three unit lecture course, should allow students to meet the CSU general education and the IGETC lab science requirement.

FALL (IV A-D)

	2000	2001	2002	2003	2004	2005
GEOLOGY						
WSCH	96	82	108	151	145	71
FTE	0.49	0.29	0.29	0.29	0.29	0.29
LOAD	196	283	372	521	500	242
FTES	3.20	2.73	3.60	5.03	4.83	2.37
Retention	82.6%	76.5%	82.1%	72.4%	80.6%	
Success	78.2%	70.6%	78.6%	72.4%	74.2%	
OCEANOGRAPHY						
WSCH	125	135	134	96	57	199
FTE	0.40	0.40	0.40	0.20	0.20	0.60
LOAD	313	338	335	480	285	331
FTES	4.18	4.51	4.46	3.20	1.90	6.623
Retention	85.0%	72.1%	72.1%	81.3%	94.7%	
Success	85.0%	72.1%	67.4%	78.1%	94.7%	

CAÑADA COLLEGE
EVALUATION OF THE
COMPREHENSIVE PROGRAM REVIEW PROCESS

To improve the Program Review process your help and suggestions are instrumental. We ask that all parties responsible for preparation of this review have input into the evaluation. After completion of the Program Review process, please take a few moments to complete and return this evaluation to the chair of the Curriculum Committee.

Program Name: Astronomy, Chemistry, Engineering, Physics

Estimate the total number of hours to complete your Program Review:

Astronomy 25 hours; Chemistry 30 hours; Engineering 15 hours; Physics 15 hours

Was the time frame for completion of Program Review adequate? If not, explain. Yes

Was the instrument clear and understandable? Was it easy to use? If not, explain and offer suggestions for improvement.

Yes, with one exception. The section asking for demographics was confusing as to how/where to include this information.

Were the questions relevant? If not, please explain and offer specific suggestions. Yes

Did you find the Program Review process to have value? If not, please explain and offer suggestions.

Yes, but if improved (see additional comments) it would have more value.

Was the data you received from administration complete and presented in a clear format? Would you like additional data?

Some of the data was reasonably presented but the most current data was not available on the “Downloads” page, the data for Fall 2005 was not complete and it would have been more useful to have the demographic information for each department, and perhaps each class along with actual numbers of students rather than just percentages. The Institutional Research/Program Review data is not in the same format as the Program Review forms and this was confusing. There was also extraneous information that contributed to the confusion.

Please offer any comments that could improve and/or streamline Program Review!

There was a need to spend a great deal of time finding and then massaging the data. It is also frustrating to have the format for the Program Review changed each time. Reduce duplication of required information in Biannual report and the program review document itself (example: Program and course SLO's)**.** Include analysis of trends for spring semesters. For many small programs like engineering, curricular offerings are very different during the spring semester compared to the fall semester so that a study that focuses solely on fall semesters will not show the entire picture of how the department is doing.